JUNE 1957

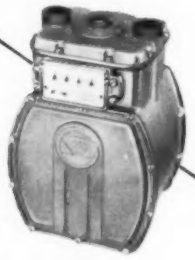
GAS

A CHILTON PUBLICATION

ENGINEERING • UTILIZATION • PIPELINES • MANAGEMENT

METHODS OF PROVING DOMESTIC GAS METERS

New slow-speed AL-250 ALUMINUMCASE METER... for sustained accuracy



MODEL AL-250 ALUMINUMCASE
Rated capacity 250 cfh of 0.64 sp. gr. gas at ½-inch w.c. differential—5 psi working pressure.

The new American® AL-250 Aluminumcase Meter operates at only 7 revolutions per cubic foot providing proven tin meter accuracy possibilities through greater power and slow-speed operation.

Every field-proven design feature pioneered by American is incorporated including oil impregnated porous bronze bearings, internal rubber grommet seals . . . PLUS

- **AMPLE POWER**—with large, 3-convolution molded Duramic diaphragms for all fuel gas services.
- **FLAG RODS**—heavier, reinforced construction.
- **LIGHT WEIGHT**—aluminum alloy pressure die-cast body reduces shipping weight . . . easy meter handling and setting.
- **INTERCHANGEABILITY**—aluminum alloy and cast iron tops interchangeable in setting with 5B and 10B Ironcase Meters.
- **DIE CAST METER CONNECTION THREADS**—minimize galling.
- **EASY READING INDEX BOX**—clear, high impact strength molded plastic insures full index visibility.
- **DISTINCTIVE DESIGN**—modern styling insures customer acceptance.

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)

GENERAL SALES OFFICE: Philadelphia 16, Penna. · Albany · Alhambra · Atlanta · Baltimore · Birmingham · Boston · Chicago · Dallas · Denver · Erie · Houston · Kansas City · Los Angeles · Minneapolis · New York · Omaha · Pittsburgh · San Francisco · Seattle · Tulsa · Wynnewood
IN CANADA: Canadian Meter Company, Ltd., Milton, Ontario · Calgary · Edmonton · Regina

SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters • Instruments • Reliance Regulators • Apparatus • Valves

Made for each other...

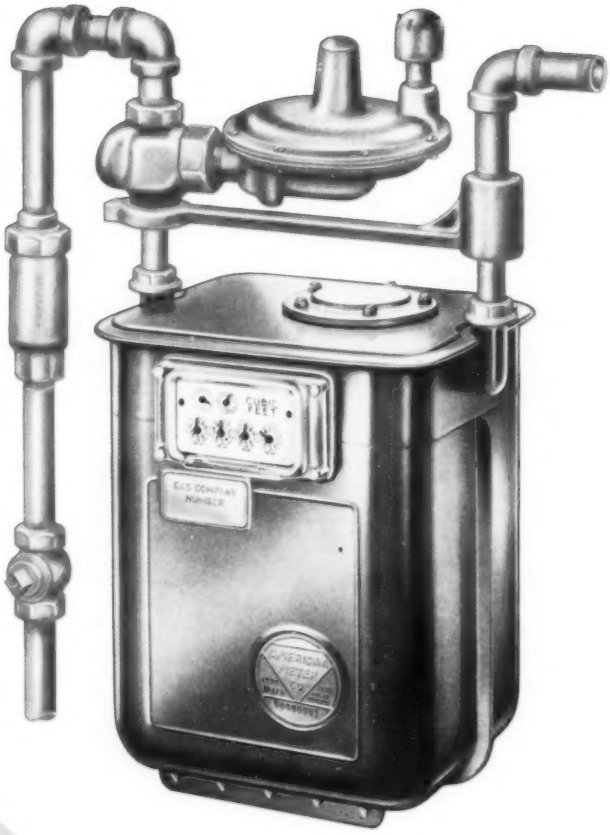
Make gas behave with
RELIANCE

Sustained accuracy with
AMERICAN

For the Gas Industry, Commercial Buildings, Industrial Plants and Homes

RELIANCE Regulators and Filters meet every service requirement. A complete line for every application, they provide precision accuracy because of precision filtering and regulation. Wherever gas is handled, the men behind the scenes depend on RELIANCE for safe, reliable, trouble-free equipment.

AMERICAN Welded Steelcase Meters bring proven tin meter accuracy possibilities to an intermediate pressure meter. Light (16 pounds) and compact, easy to handle, they manifold in a minimum area. Eye-appealing lines assure customer acceptance—reflect the impression of better service and value through use of the finest, safest equipment.



Welded Steelcase Model W-175 Meter with Regulator, Filter and Meter Bar

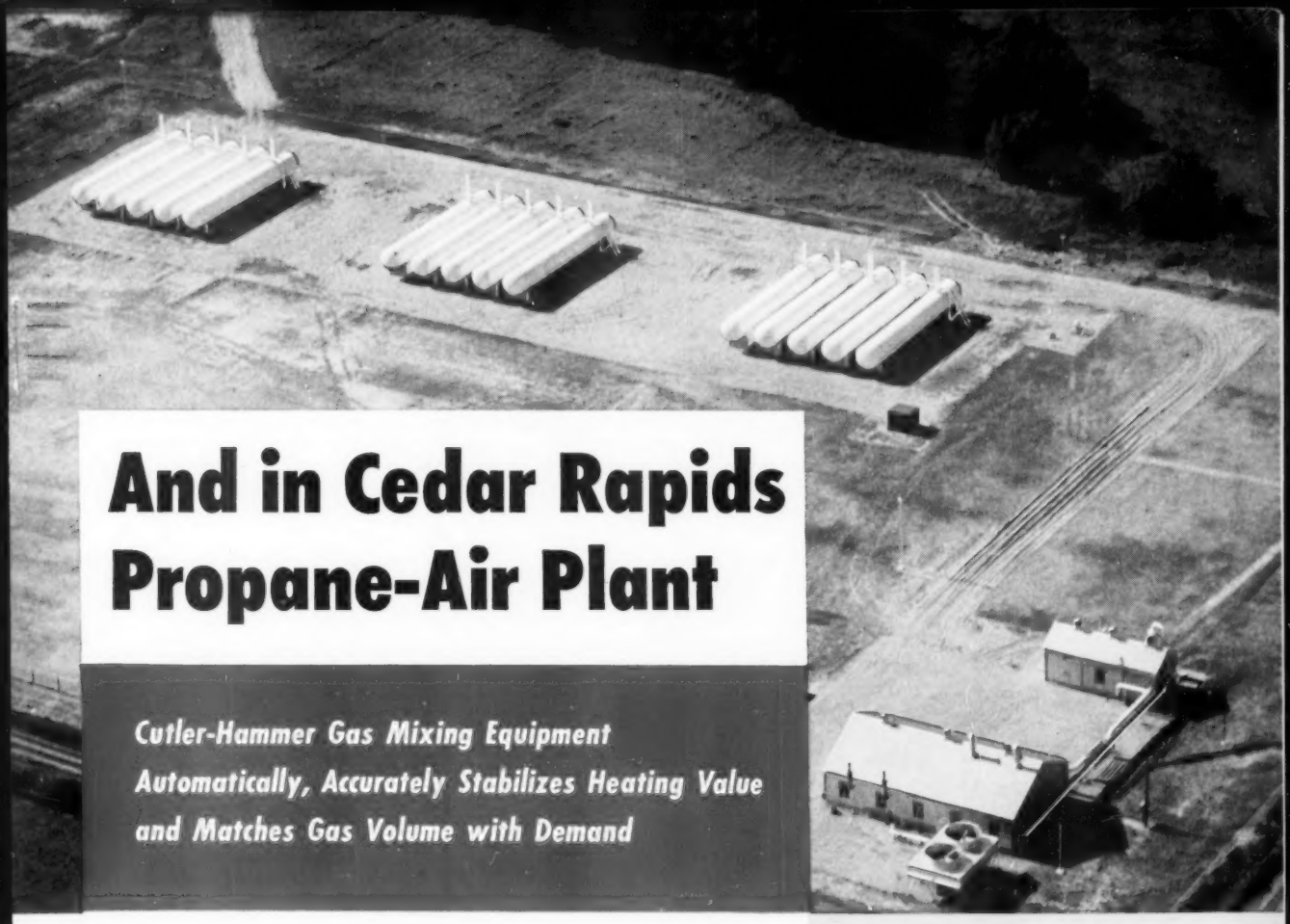
***Keep upkeep down with* RELIANCE *and* AMERICAN**
Filter, Regulator and Meter engineering at its best

BULLETINS ARE AVAILABLE ON ALL TYPES OF RELIANCE FILTERS AND REGULATORS

AMERICAN®
METER COMPANY
INCORPORATED (ESTABLISHED 1836)

AMERICAN METER CO
EST. 1836
MEASUREMENT ENGINEERS

RELIANCE
REGULATOR DIVISION
ALHAMBRA, CALIFORNIA



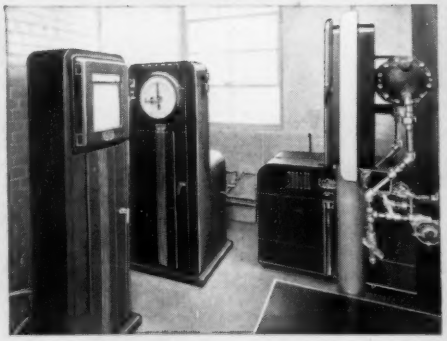
And in Cedar Rapids Propane-Air Plant

Cutler-Hammer Gas Mixing Equipment Automatically, Accurately Stabilizes Heating Value and Matches Gas Volume with Demand

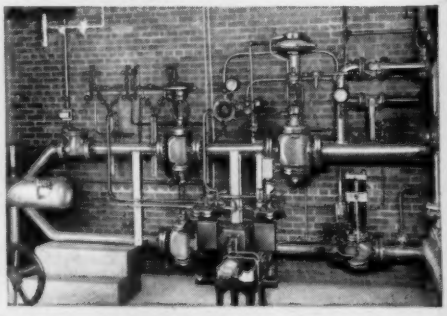
As the use and distribution of natural gas spread, more and more utilities find it necessary to erect peak-shaving plants to meet unpredictable demands, and to be able to satisfy their good industrial and domestic consumers under any circumstances. The Cedar Rapids plant of the Iowa-Illinois Gas & Electric Co. is an example of the propane-air plant of the type that is the simplest of all to operate.

It is equipped with Cutler-Hammer Gas-Mixing Equipment designed and engineered by Cutler-Hammer engineers to the utility's specific requirements. The Cutler-Hammer Equipment makes operation automatic; heating value and pressure are *always* and automatically stabilized to a pre-set figure; delivery of gas *always* and automatically matches demand. Such C-H equipped plants are *always* ready to supplement the basic gas supply and take over completely in the event of an emergency failure of basic supply. If you want further information about this most efficient and economical of all peak-shaving plants, write or wire at once . . . CUTLER-HAMMER, Inc., 1468 St. Paul Avenue, Milwaukee 1, Wisconsin.

CUTLER-HAMMER
B.t.u. CONTROL
C-H



This Cutler-Hammer Calorimeter measures the Btu content and the Calorimixer stabilizes the value of the propane-air mixture.



These valves and regulators are automatically and accurately controlled by Cutler-Hammer Gas Mixing Equipment, to match supply with demand.

Contents • June 1957

33RD YEAR OF PUBLICATION • VOLUME XXXIII • NUMBER 6

GAS

FEATURES

Proving domestic gas meters with pressure, vacuum methods 43
By Allen D. MacLean

What management expects of a safety program 49
By Alan R. Bailey

Automatic line speeds painting, results in more efficient job 52
By Don Wright

Audio tone control in gas distribution systems 54
By L. C. Menkes

Drying paint with gas 61
By B. C. VonEsch

Montreal can be Canada's biggest gas-consuming area 67
By Frank Chapman

PIPELINE SECTION

Investigation of gouges, arc burns in steel line pipe 107
By C. T. Schweitzer

Maintenance of compressor engines by lubricating oil analysis 113
By Duane V. Kniebes

Gas industry confident in microwave battle 122
By Neil Regeimbal

DEPARTMENTS

Editorial Comment—

Thermally Thinking, *by J. Fred Ebdon* 6
Highlights 8
Regulatory and Legislative Trends 11
Technical Trends, *by Guy Corfield* 15
Washington, *by Neil Regeimbal* ... 25
Corrosion Prevention, *by Marshall E. Parker* 73
Communications, *by Frank Chapman* .. 139

News Developments—

Equitable's management rated excellent 69
Utilities warned about stock rights offerings. 90
Offshore deal okayed; rates under study 125
Rail and highway crossing code to be studied 128
Cooperatives withdraw FPC applications 130

Departments—

People 74
Digest of New Products and Trade Literature. 84
Associations 98
Calendar 102
Pipeline People 136
Progress Reports 152
Advertisers' Index 154

GAS is published monthly. Copyright 1957 by Chilton Company, 56th and Chestnut Streets, Philadelphia 39, Pa. Subscription price: United States and possessions and Canada (in advance): one year, $2.00; two years, $3.00. Mexico, South and Central America, Caribbean Area: one year, $3.00; two years, $5.00. All other countries: $10 per year.
Accepted under Section 34.64 P.L.&R. authorized. Members: Business Publications Audit of Circulation, Inc., National Business Publications, Inc. GAS is indexed regularly by Engineering Index Inc. The name "GAS" is registered U. S. Patent Office.

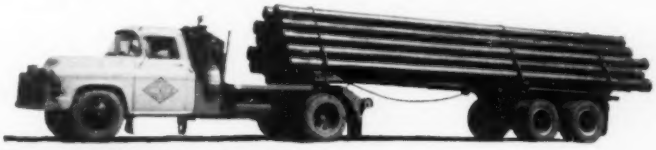
★Congrats and $25.00 to
T. R. EMBACH, Pure Oil Company,
Crystal Lake, Ill., for this quip.

"..lookin' for a loggin' job"

World conditions call for more and more oil . . . and in turn, more and more Lone Star pipe . . . API casing, tubing and line pipe.

Our friend and neighbor, Joe Roughneck . . . heart of the oil and gas industry . . . knows our plant is operating day and night to supply his needs. He knows, too, that we're working on our new stretch-reducing mill and another open hearth furnace. Ultimately, these will mean more steel and more pipe for this ever-expanding industry.

Neighbor, wherever you are, specify Lone Star and we both get a good deal.



Lone Star STEEL COMPANY

LSS

EXECUTIVE SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas

DISTRICT SALES OFFICES

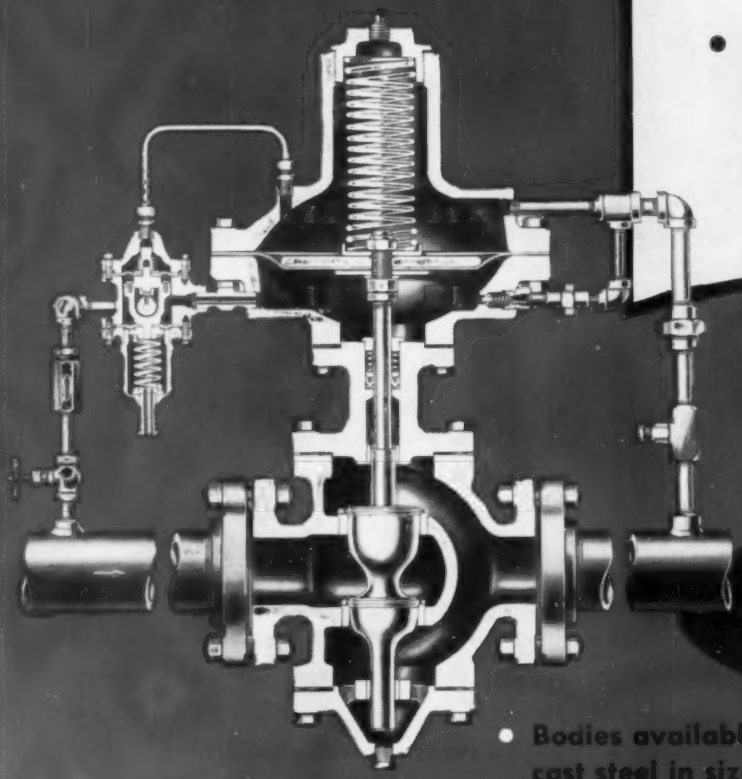
Houston, Texas
Tulsa, Oklahoma

Midland, Texas
Wichita Falls, Texas

San Antonio, Texas
Shreveport, La.

FISHER® Series 880

- STABLE CONTROL UNDER ALL CONDITIONS
- NO BLEED OF PILOT LOADING GAS TO ATMOSPHERE—IDEAL FOR PIT INSTALLATIONS



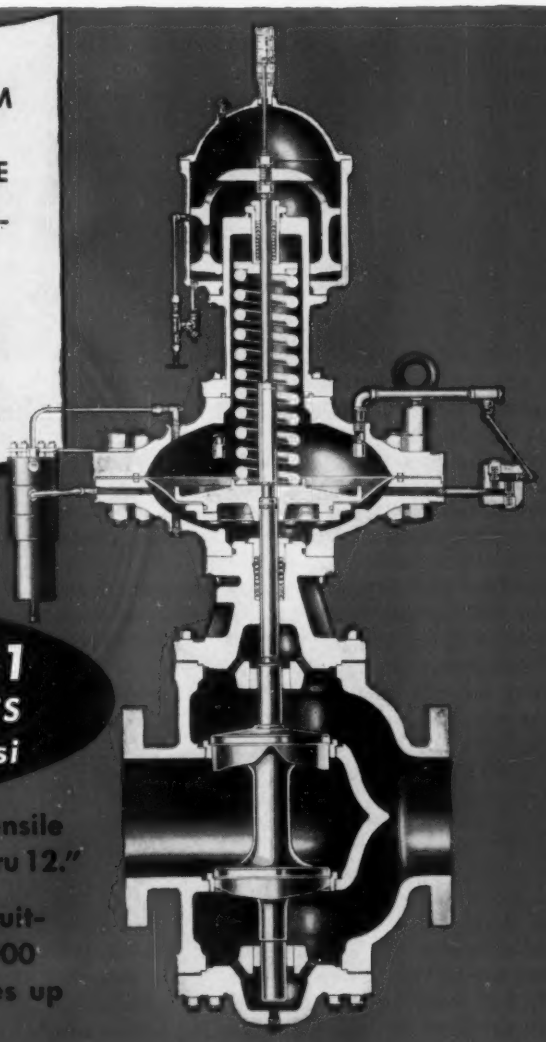
TYPE 880
FOR PRESSURES UP TO 600 psi

- Bodies available in high tensile iron or cast steel in sizes 2" thru 8".
- Diaphragm casings suitable for pressures up to 300 psi.
- Outlet pressure ranges up to 250 psi.

FISHER GOVERNOR
MARSHALLTOWN, IOWA
LEADS THE INDUSTRY IN RESEARCH FOR BETTER

THE ANSWER TO YOUR HIGH PRESSURE REGULATOR PROBLEMS

- AVAILABLE WITH DIAPHRAGM CASINGS THAT WILL WITHSTAND FULL INLET PRESSURE
- SPRING CLOSED CONSTRUCTION—INSURES POSITIVE ACTION AT ALL TIMES
- PRESSURE BALANCED TYPE LOADING PILOT PROVIDES FAST & ACCURATE CONTROL



TYPE 885-1
FOR PRESSURES UP TO 1000 psi

- Bodies available in high tensile iron or cast steel in sizes 2" thru 12."
- Steel diaphragm casings suitable for pressures up to 1000 psi. Outlet pressure ranges up to 450 psi.
- Rugged and simple oil dash pot eliminates any "jumping" tendency or excessive vibration.

INFORMATION ON SUCCESSFUL OPERATION OF ANY OF 880 SERIES REGULATORS GLADLY FURNISHED ON REQUEST

COMPANY
WOODSTOCK, ONTARIO
GAS PRESSURE CONTROL

FISHER
Since 1880

GAS Thermally Thinking

A look at the future

THE natural gas pipeline of the future—the deep-thinkers tell us—may be built with pipe made from synthetically grown metals or a plastic, probably toughened by atomic radiation. Pipe will be light and will have extreme pressure-handling capability.

The pipeline may be molded in the field. It may issue forth from an electronically controlled machine much like toothpaste squeezed from a tube. Current big-inch and super-inch diameters will be the "spaghetti" of the future.

The communications-control point of this highly futuristic pipeline will be the instrument engineer's delight. It will have more recorders, dials and pushbuttons than the flight deck of a DC-7.

Supervisory function will be by closed-circuit color television. Camera scan and position will be remotely controlled from the control-communications point. Information will be recorded by telemeters. Operators will be controlled by computers making decisions unaffected by human errors.

This is not the preface page of a new science fiction thriller. Some of these things are closer than a lot of us realize. Certainly the art of telemetering is stable and we have only scratched the surface of the potential application. Computers, automatic or remotely controlled compressor stations and industrial TV are not unheard of.

Actually, these are only a very few of the developments in planning stages or under active research. They are the products of technical progress and they will not be denied. Many of these ideas will carry over into distribution work and most are directly applicable.

But, is the utilization end of the industry keeping up with such advanced research and planning? Will the domestic, commercial and industrial appliances and equipment match the modernity of the futuristic transmission and distribution systems?

We can't answer our own question. However, it is up to gas companies, our associations, and each of us to join with gas utilization equipment manufacturers to make very sure we can answer this question in the definite affirmative.

Seemingly, the average American housewife likes pushbuttons, flashing lights, etc. Perhaps she wants to feel she has a little bit of that DC-7 flight-deck atmosphere. She will do most of her chores from a central control console. Our job is to develop the operated components to the point where the users will not consider units other than gas-fired on the end of the control circuits. Styling—from modernistic through contemporary to western-ranch and French provincial—will be as important as color and built-in features. And these appliances will have to continue performance of their designed job better than any appliances using other energy.

Commercial and industrial gas-energized equipment will have to match the terrific pace set by process research and development. Here, again, we have only seen the beginning.

It is not too early to consider our industry in relation to the technical age.

J. Fred Ebdon

EDITOR

A CHILTON PUBLICATION
198 S. Alvarado St., Los Angeles 57
Tel. DUnkirk 7-4337

Frank Chapman, Publisher

J. Fred Ebdon, Editor

Don Wright, Managing Editor
Guy Corfield, Technical Editor
Barbara Hall, Assistant Editor

Gilbert Bowman, Promotion Manager
Mary Lou Hanson, Production Manager
M. A. Kesterson, Circulation Manager
Raymond A. Grote, Art Director

ADVERTISING OFFICES

New York (17)
Joseph R. Geryk
100 E. 42nd St.
OXford 7-3400

Cleveland (15)
Frank J. Enright
930 B. F. Keith Bldg.
1621 Euclid Ave.
SUperior 1-2860

Chicago (1)
Richard L. DeMuesy
360 N. Michigan Ave., Suite 418
RAndolph 6-2166

Tulsa
John Sangston
621 Petroleum Bldg.
Office: LUther 4-1769

San Francisco
Frank McKenzie
Merchandise Mart
1355 Market St.
UNderhill 1-9737

Los Angeles (57)
Jack Kay
198 S. Alvarado Street
DUnkirk 7-4337

JOS. C. HILDRETH, Board Chairman
G. C. BUZBY, President

Vice Presidents: P. M. Fahrendorf, Harry V. Duffy. Treasurer, William H. Vallar; Secretary, John Blair Moffett; Directors: George T. Hook, Maurice E. Cox, Frank P. Tighe, Leonard V. Rowlands, Robert E. McKenna, Irving E. Hand, Everit B. Terhune, Jr., Russell W. Case Jr., John C. Hildreth, Jr.

MOST PROFITABLE RIG YOU'LL EVER OWN!

Job records prove this new *heavy-duty* Case® "320" loader-backhoe beats anything you ever saw on trenching, loading, back-fill and clean-up jobs. What's more, it will perform at LESS COST than any other machine on the market. You also gain important *peace of mind* service-wise, because complete unit — tractor, loader, backhoe — even the engine — is *built and factory-mounted by Case,* sold and serviced exclusively by Case Industrial Dealers. You don't deal with one outfit on the *tractor* . . . another outfit on the *loader,* and still another outfit on the *backhoe.*

Furthermore, *ONLY* the Case "320" gives you a heavy-duty industrial bumper and radiator guard . . . recessed headlights . . . *one-piece forged steel front axle* . . . extra heavy wrap-around sub-frame assembly . . . comfortable two-way operator's seat that reverses instantly for operating front or rear mounted equipment . . . PLUS power steering, and a proven shuttle transmission that lets you go forward or back-up at 27% *faster reverse speeds* — without shifting gears. See this rugged, high-speed money-maker today at your Case Industrial Dealer's, or mail coupon for details.

Complete Case Unit — tractor, front-end loader and backhoe sells for only

$5580

FOB Factory — plus tax where applicable. Price subject to change.

Foot-controlled 180° backhoe swing speeds-up operating cycles . . . lets you move more dirt in less time. Backhoe digs 12½' deep, has extra-wide telescoping tubular stabilizers for extra stability.

Wide ½-cu. yd. front-end loader has 26° break-out angle plus automatic power-levelling for moving bigger loads without spillage. Bucket rolls forward 60° for smoother backfilling.

CASE

FIRST in quality for over 100 years

Clip . . . mail for free literature

J. I. CASE CO., Dept. F1397, Racine, Wis., U.S.A.

Send free literature on: ☐ Case 320 Backhoe-Loader ☐ 42 HP TerraTrac Dozer ☐ 2-cu. yd. TerraTrac loader

Name..... Position.....

Company .....

Address .....

City..... State.....

C-BL-43

industrial wheel and crawler tractors • loaders • dozers • backhoes • fork lifts

GAS highlights

SPOT NEWS, TRENDS, COMMENT ON GAS INDUSTRY AFFAIRS

JUNE 1957

The Citadel of the stuffed flounder and crayfish bisque—New Orleans—hosted the over-two thousand delegates of the Southern Gas Association early in May. It's a big—probably the largest—regional association and is still growing. SGA yearly holds the most "social" convention. However, it also holds one of the best meetings under the able management of R. R. "Bob" Suttle.

On the opening day a call was heard for more promotion and research. Speakers urged larger contributions for the PAR program and pointed out that the program should be carried through on the local level.

SGA President R. A. Puryear Jr., who also heads Alabama Gas Corp., departed radically from the traditional SGA concentration on sales to pinpoint the need for adequate field prices for natural gas. He mentioned that ". . . too many of our newly discovered gas reserves turn up merely as a by-product in the search for crude oil." Mr. Puryear urged industry action on the new Harris-O'Hara gas bill on a united basis.

To sell the safety you know, there are four principles of telling what you know. This is the philosophy of Dr. Arthur Secord, Brooklyn College, as told in his address before the accident prevention session of the SGA meeting. The four principles:

1. Speak the other fellow's language.
2. Sell only one bill of goods at a time.
3. Dramatize points with examples.
4. After being critical, leave with a pat on the back.

Operating areas of SGA member companies blanket the air conditioning belt of the nation. During the New Orleans get-together, most of the speakers sooner or later got around to the subject in one way or another. It got so bad that speakers scheduled to present air conditioning papers had to revise them from hour to hour as previous speakers "stole their stuff."

Be that as it may, the situation is healthy for gas air conditioning. Everybody was talking it up down there and it should spread to other parts of the country. However, SGA's President Puryear warned against a "wait 'til next year attitude." Several delegates mentioned there had been many words about gas air conditioning in SGA meetings without subsequent sales effort in the same volume.

An SGA subcommittee under the leadership of John Monroe, Lone Star Gas, Dallas, has gone to work on the General Services Administration to rewrite federal specifications to permit installation of gas-powered units for air conditioning federal buildings.

The controversial Midwestern Gas Transmission line should be built and in operation by next year's heating season, Tennessee Gas Transmission President Gardiner Symonds told the Los Angeles Society of Security Analysts recently. Mr. Symonds said he believes that the TGT subsidiary will be certified by the FPC before the end of 1957. He said Midwestern will begin building the 1100-mile big-inch line immediately after it is approved, and will be in operation by the fall of 1958. Consolidated hearings on the Midwestern proposal, and competing proposals started last month in Washington.

The current controversy created by efforts of common carriers to take over operation of private microwave frequencies drew much heated criticism at the AGA transmission conference May 8-10 in San Francisco.

Speaking at the opening general session, Dwight Sprow, general superintendent of Natural Gas Pipeline Co. of America, urged the gas industry to do everything in its power to retain control of its private communications systems. "We cannot accept the premise that the public would be better served by a common carrier," Mr. Sprow said. He pointed out that a gas transmission company must maintain communications at all times and questioned the efficiency with which a common carrier would act in case of an outage.

"The gas business pioneered private communications systems," he said, and cannot now sit back and see these systems taken over by common carriers.

More notes from New Orleans . . . In February 1956 Frank Smith of Houston Natural and John Flanagan of United Gas Corp., Houston, made and seconded the motion that brought the gas industry's national television program to life. Frank H Trembly, chairman of the national gas industry television committee credited the Southern Gas Association as the godfather of the television program.

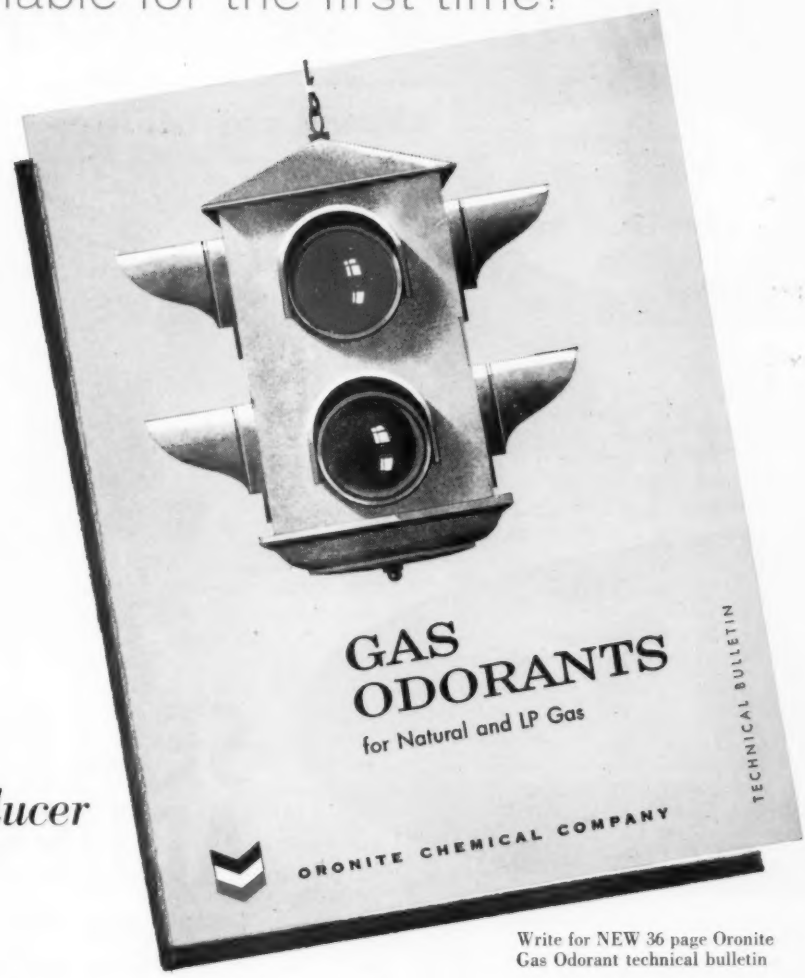
"Just" $2.25 million were needed to put "the show on the road." It was not an easy amount to raise. But, for the first time utilities, pipeline companies and manufacturers got together on a national project. "Playhouse 90" was partially sponsored by the gas industry in April 1957.

"Never before has our industry presented its story before so large an audience. This has completely rejuvenated the industry's outlook in national advertising . . .," Mr. Trembly said.

Available for the first time!

A complete story on Gas Odorants

...from the leading producer



Write for NEW 36 page Oronite Gas Odorant technical bulletin

An Oronite® odorant will best fit your requirements —choose it from this list of quality odorants

Calodorant® "C" — best quality sulfide type odorant
Calodorant® "B-1" — a sulfide odorant at a mercaptan price
Alert® "80" — best economy-priced, quality mercaptan odorant
LPG Odorant — tailor-made from a selected mercaptan cut
Ethyl Mercaptan — an odorant of highest quality and purity for LP-Gas.

To get Oronite's complete story on gas odorants, fill in the coupon below or write to the Oronite office nearest you.

ORONITE CHEMICAL COMPANY

Executive Offices
200 Bush Street, San Francisco 20, California

Sales Offices
San Francisco, New York, Wilmington, Chicago, Dallas, Cincinnati, Los Angeles

European Office
36, Avenue William-Favre, Geneva, Switzerland

4175

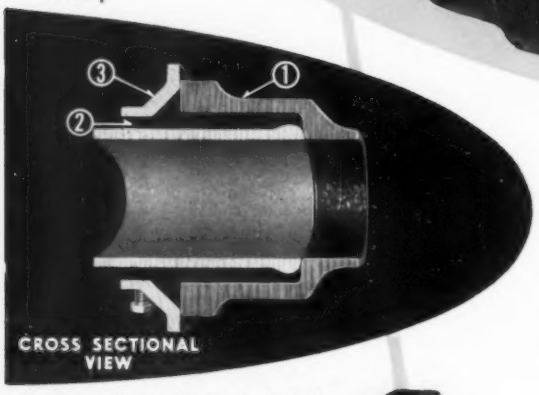
Oronite Chemical Company
200 Bush St., Dept. "O"
San Francisco 20, Calif.

☐ Please send me your new gas odorant technical bulletin.
☐ Please have an Oronite gas odorant specialist call on me regarding our requirements.

Name_____
Firm_____ Title_____
City_____ State_____

Simplified Bell Joint Clamps

1. Bell joint
2. Perma-Seal Compound
3. Bell joint clamp



SEALED BY ADHESION

WITH PERMA-SEAL COMPOUND

WITH THE FOLLOWING ADVANTAGES:

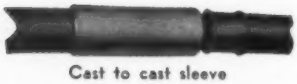
- Smaller street openings required because no excavating or cleaning necessary in back of the bell.
- The clamp does not require adjustment, or filling and facing of the bell.
- ***The clamp is engineered to fit all variable pipe wall thicknesses without adjustment and to fit all types of bell joints including sleeves, drip pots, valves and odd size pipes.*** Available sizes: 3" to 36" diameter.
- This clamp fits in confined areas because it requires no greater area than the existing bell for installation.
- ***This leak clamp becomes a seal by adhesion rather than by compression.***
- This clamp allows ground movement and vibration to take place without the danger of leaks after installation.
- Once installed the joint becomes trouble-free and permanent.

Write: for full information and prices about the Newest Method in Pipe Connections

New Perma-Seal and Safety Seal Weld sleeves available for steel to steel, steel to cast iron, split sleeves for repair of steel pipe, and completely insulated sleeves for corrosion control.

Typical installation in the removal of valve and replaced with safety seal weld sleeves.

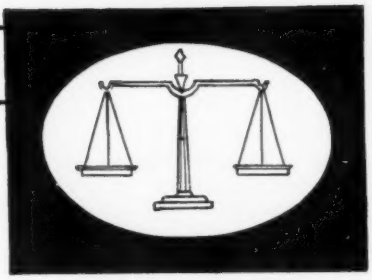
Steel to steel sleeve



Cast to cast sleeve

UNITED PIPE LINE CONTRACTORS, INC. BOX 839, BELOIT, WISCONSIN

*regulatory and legislative trends



Rate relief will be faster

A COMMITTEE of the American Gas Association has performed a valuable service to the industry. It has studied methods for accelerating the process of obtaining gas rate changes in the United States. This will hearten management because there is hope of minimizing the time during which a utility absorbs an unrecoverable loss while waiting for rate relief. Of course, there is an inevitable lag between the time a company files an application with the commission for a rate increase, and the effective date of a decision.

Managers of utilities know that financial vitality is essential to rendering good service. There are many bright ideas contained in the AGA committee report to help management plan rate cases to keep gas companies financially healthy.

There is a prospect of the need for frequent rate increases in the future to offset the rise in labor and material prices. Many rate cases require one year to process, so let us review methods which will reduce that regulatory lag.

Statutory provisions

There are 27 states having statutory provisions covering rate increases within a limited period of time. Ordinarily, a rate increase must be approved after a hearing and may be suspended for various periods. At the end of suspension periods if no decision has been rendered, the commissions in 21 states must allow the new rates to become effective. In two out of 27 states they must prescribe new rates at the end of the suspension period. While 19 states allow rate increases subject to refund, there are only 8 states where the statute provides that the filed rates may become effective, despite an order by the commission suspending the proposed rates.

One of the most important financial problems facing many gas distribution companies is that of the increased cost of gas purchased from interstate pipeline companies operating under the Natural Gas Act. It is the usual practice of the Federal Power Commission to suspend pipeline rate increases for the full statutory period. This means that multi-million dollar gas rate increases can go into effect after six-months elapsed time, but subject to refund when final rates are fixed by FPC.

The customers of the interstate pipeline companies are usually local gas distribution companies. They may be financially injured if they do not have the same kind of statutory machinery available to obtain a timely rate increase to offset the higher price they must pay for natural gas. Only 10 states have statutes which allow such increases in the price of gas to be passed on immediately to local consumers. Five more states may grant temporary rates to cover such cost increases. In 17 other states a formal hearing is required before such costs for purchased gas can be assessed against ultimate consumers. In a total of 32 states, then, some method providing offsetting rate relief is available.

In 27 states cost of gas adjustment clauses are used, and in 14 of those states rate changes are allowed which are based on changes in other expenses. In four states automatic rate adjustment plans based on an agreed rate of return are permissible.

AGA has reported that 164 of the total 875 gas companies reporting to it had rate adjustment provisions included in their rate schedules.

All of these plans permit changes in costs to be borne by ultimate consumers with almost no delay. They are, therefore, an effective means of accelerating the processing of rate changes. In most natural gas distribution companies the cost of purchased gas exceeds one-half of all direct operating expenses. It then becomes advisable for gas distribution companies to obtain commission approval of purchased gas automatic adjustment provisions. This procedure is far superior to that which requires formal hearings and a full rate case before rate relief is granted. The ability to reflect such cost changes in a major item of expense is important to the maintenance of the companies' financial integrity.

Some state commissions contend that the use of automatic price adjustment clauses removes their function to regulate rates. The answer is that regulatory commissions have continuous jurisdiction, and are always in a position to initiate a rate case when they think the earnings of a utility are unreasonably high.

Public Relations

Good public relations are important elements in obtaining rate increases promptly. In addition to earning the good will of the public through dependable service, a utility should be impressing its public through its personal relationships

***A monthly commentary on national and state developments by an expert in the field of utility law.**

Regulatory trends . . . Pre-trial conferences help shorten rate cases

and advertising. This will help condition the public to the rising costs of rendering gas service, and the need for compensatory rates. People do not object to paying a fair share of the cost of service when they are informed that there is no discrimination, and that the company is trying to minimize costs by operating efficiently.

Preparation of rate cases

Some state commissions require that an application for a rate increase be accompanied by all of the exhibits necessary to justify the amount requested. This saves months of processing time. A utility can accelerate a rate proceeding by prompt and complete preparation of its evidence. Many commissions prefer that the executives repsonsible for departmental operating expenses be the witnesses because they are best informed. In some states testimony prepared in advance to explain exhibits will be served prior to the hearing date. That permits conservation of the number of hearing days, because cross-examination will follow immediately after the evidence is presented. This is in contrast to the customary long recesses requested to prepare for cross-examination.

Another method of shortening rate cases is the utilization of pretrial conferences with the commission's staff and other participants. This permits the agreement on various issues, and will reduce the number of subjects in conflict.

Commissions can accelerate the proceedings by permitting the incorporation of the evidence in prior cases involving the same utility. This eliminates repetition.

One practice which has a tendency to cause delays is the introduction of studies estimating the cost of rendering service to customers. Unless such studies are required, the necessity for using detailed cost analyses, or allocations among classes of service, should be challenged.

Improve commission efficiency

There is no organization that cannot be improved, and this includes regulatory commissions as well as utilities. Since World War II the burden upon most commissions and their staffs has multiplied, and has contributed to delays in the regulatory process. Many commissions have recognized this situation, analyzed it, and improved their working efficiency. Enlightened commissions know that unreasonable delay may seriously injure a utility's credit standing. The result is that new capital required for replacements and additions will cost more. Commissions should be informed that it is better to make moderate rate increases promptly than try to restore impaired credit at a greater over-all cost to the ratepayer in the long run.

One means of expediting the work and improving the efficiency of a regulatory commission is to make working conditions and compensation more attractive. If that is done, a higher caliber of public employee will join the staff of regulatory agencies.

If the commission's staff is receptive, it should be kept informed periodically of a utility's problems. Occasional discussions between utility representatives and the staff will be most helpful in reducing the length of time necessary for reviewing rate case information in an emergency.

Shrinkage in earnings

During the current period of inflation, the costs of replacements and additions are many times the original cost of gas company facilities. The result is that with no change in consumers' rates the earnings shrink in relation to the investment in facilities. Some commissions call this "attrition," and have tried to compensate for it. When there are delays in ratemaking, the amount of attrition will increase. If the commission does not reflect such increased costs in its final decision, the utility will be unable to earn the return authorized by the commission. In that case the utility must file for a new rate increase much earlier than otherwise.

In a recent case the California commission attempted to offset the known attrition by making an allowance in the rate of return for the test period. The commission considered a 6.1 per cent rate of return reasonable for the future. It also analyzed the declining trend in return, and made an allowance of 0.6 per cent for such attrition. Thus, it adopted a 6.7 per cent rate of return on the test year rate base with the expectation that the future realized return would be 6.1 per cent.

The District of Columbia commission has made allowances for regulatory delay and other factors causing past deficient earnings. The commission observed that the utility should be provided a reasonable cushion against the causes which prevented it from earning in accordance with the commission's estimates and the company's estimates. The commission stated that important considerations permitted the fixing of a rate of return higher than that provided by the "cost of money" analysis. It added:

"These considerations include: the period of time during which the company has served at a rate of return substantially below that established as fair and reasonable in the last rate order; the clear possibility of contingencies increasing the company's costs in the future above the now predicted levels as has happened in each of the years during the recent past; 'value of service' considerations; and the other intangibles to which we have already adverted."

All procedures for eliminating the delay in processing utility rate cases are in the public interest. Justice too long delayed is justice denied. In addition, reasonably prompt changes in gas rates to make them compensatory will promote more stabile gas utility earnings. That stability assists in attracting the millions of dollars needed, on favorable terms, by the important and fast growing natural gas industry. ■

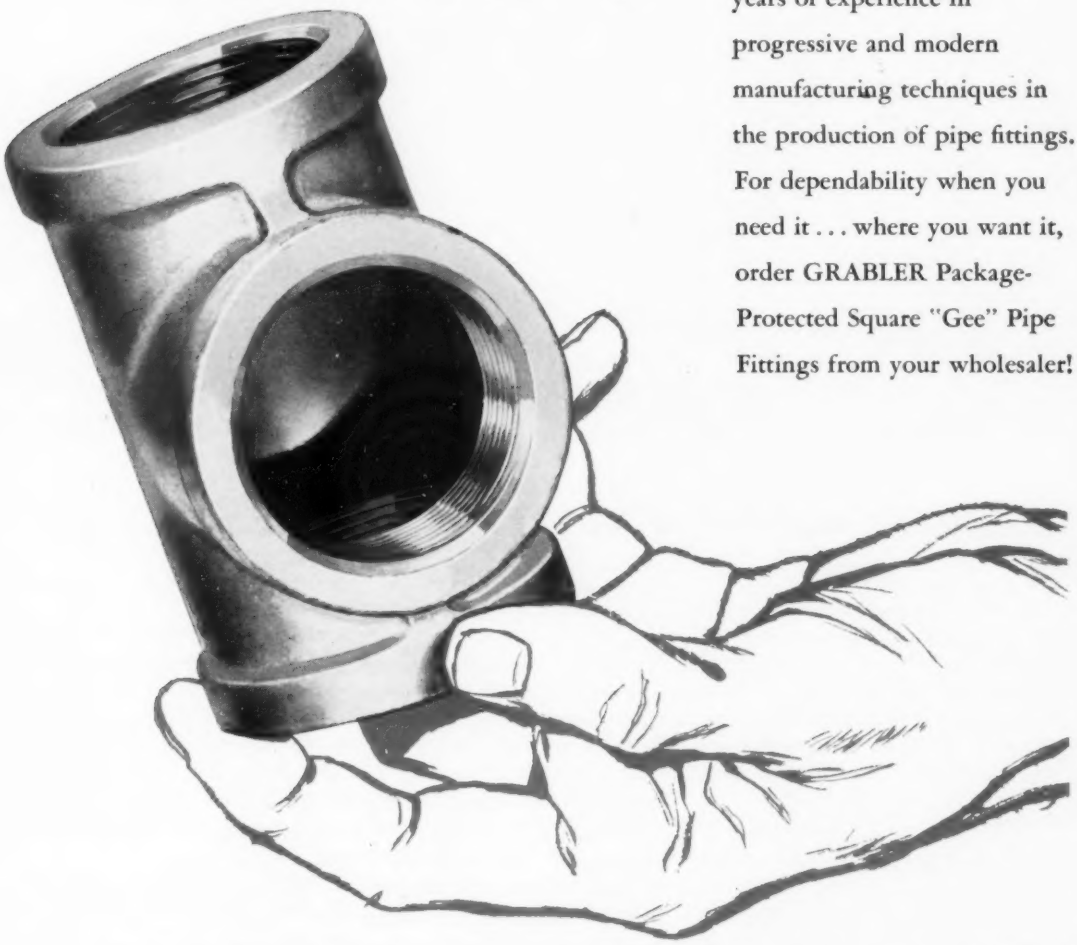
Dependability...

Be sure of it with

GRABLER

SQUARE "GEE" Pipe Fittings

The dependability and uniformly high structural qualities of GRABLER Square "Gee" Pipe Fittings are the result of more than 50 years of experience in progressive and modern manufacturing techniques in the production of pipe fittings. For dependability when you need it . . . where you want it, order GRABLER Package-Protected Square "Gee" Pipe Fittings from your wholesaler!



Dependable Distribution from these Warehouses:
New York • Philadelphia • New Orleans
Atlanta • Pittsburgh • Cincinnati • Dallas
Chicago • St. Louis • Detroit • Denver
Minneapolis • San Francisco • Los Angeles

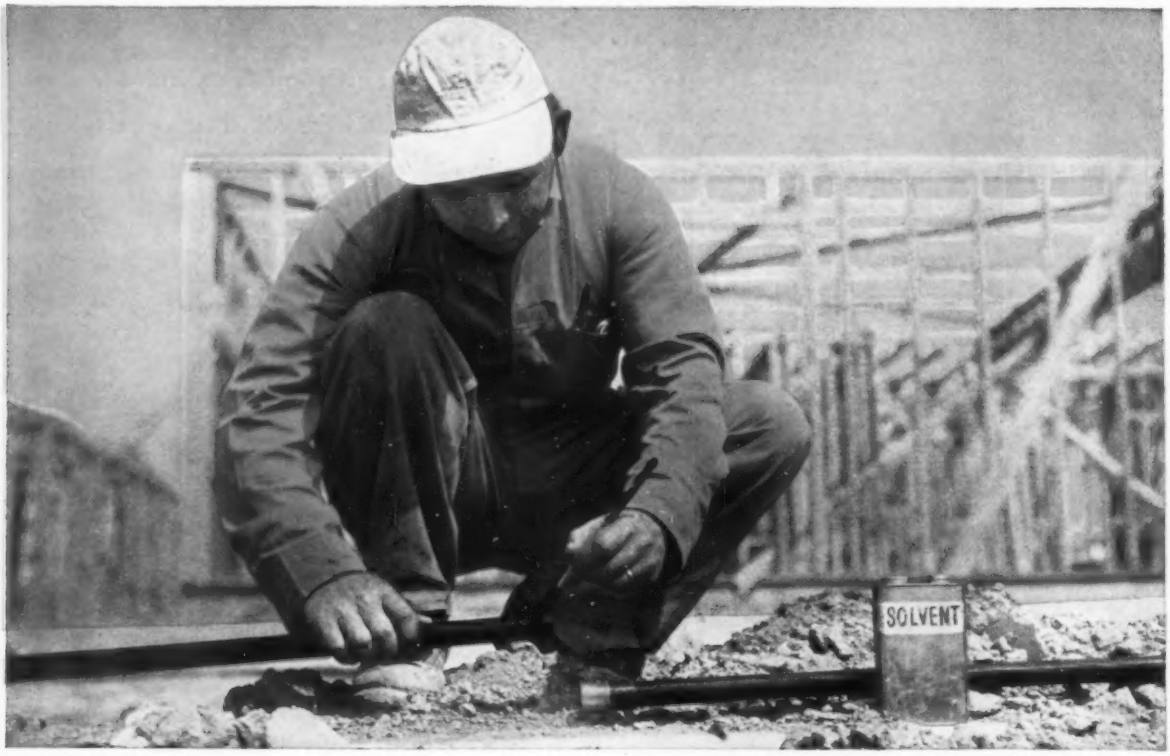
GRABLER

Manufacturers of the SQUARE "GEE" Line of Pipe Fittings

The GRABLER Manufacturing Co. • 6565 Broadway • Cleveland 5, Ohio

Naugatuck KRALASTIC

RUSTPROOF, CORROSIONPROOF, LIGHTWEIGHT, TOUGH, SNAKEABLE PLASTIC PIPE



and it welds with a *brush!*

No need for expensive welding equipment—no time wasted—Kralastic pipe can be joined in *seconds* by *anyone!*

Just paint mating surfaces of Kralastic pipe and fitting with a special solvent or cement—slip them together and allow them time to set, and you have made a connection as durable as the pipe itself!

And Kralastic *is* durable!

It can't rust or rot, is permanently free of electrolytic corrosion. It's unharmed by soil acids, natural gas, most chemicals. And because it's one of the toughest of all plastic materials, it resists damage from tools, rocks, and rough handling.

What's more, Kralastic pipe is flexible enough to be snaked through many existing lines—to follow uneven ground contours without costly, job-prolonging fittings. And it's easily cut with an ordinary hacksaw.

This tough rubber-resin material—one of the first to produce successful plastic pipe—has proved itself not only in natural gas lines, oil field pipe, and valves of many kinds, but in hundreds of other *tough* applications including water transmission lines.

Better investigate Kralastic® pipe and learn more of its *many* advantages. Write today to the address below.

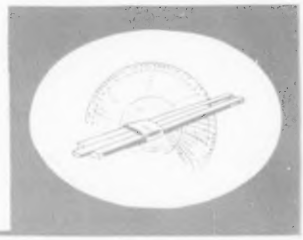
United States Rubber

Naugatuck Chemical Division

Naugatuck, Connecticut

BRANCHES: Akron • Boston • Gastonia, N.C. • Chicago • Los Angeles • Memphis • New York • Philadelphia • IN CANADA: Naugatuck Chemicals, Elmira, Ontario
Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N. Y.

technical trends



By GUY CORFIELD

The Sun At Work

"The Sun at Work" is an expression that describes the interest of the Association for Applied Solar Energy that has its headquarters at 3424 N. Central Ave., Phoenix, Ariz. It is also the name of a quarterly journal which this association publishes describing its various activities, and developments and installations concerned with harnessing solar energy. A subscription to this quarterly costs $2.50 per year.

The December 1956 issue discloses the completion, on Aug. 15 last, of an office building in Albuquerque, N. M. that is solar-heated with heat-pump combination that also provides summer cooling. The essential details are written as follows:

"The gross building area is 4300 sq ft. The collector panels have a total area of 790 sq ft, a ratio of floor area to collector area of 5.45 to 1. Flat plate aluminum collectors are used, constructed by the Western Brass Mills "Roll-Bond" process in which the tubes are integral with the plate. The plates are plated with a special heat absorbing paint and covered with a single sheet of common window glass. The whole collector is tilted at an angle of 30° from the vertical and forms most of the south wall of the building.

"Storage for night-time and low energy periods is accomplished by a 6000-gal. water tank installed underground. Water was chosen as the transport and storage medium because of its cheapness and relative non-corrosiveness. The heating and cooling distribution system within the building is a combination of radiant floor and ceiling panels with a central air handling unit for ventilation. The floor panels are used for heating only while the ceiling panels and air unit are used for both heating and cooling. This distribution system allows the use of low temperature water (95-110° F) for heating, an important factor in collector efficiency.

"A 7½-ton refrigerated water-chiller unit is used as a heat pump with the collector as the source, to allow the use of a smaller collector and storage tank than would otherwise be required. This unit is also used for summer cooling. It can be argued that this system is not then completely solar heated and it is true that the heat of compression is put in as electrical energy. However, this is a very small part of the total heat used and the basic source of heat is still the collector.

"An evaporative water cooler is used on the cooling cycle as a cooling tower for the refrigeration unit or, during periods of light cooling load, as the direct source of chilled water for the distribution system. One of the basic operating cycles has the evaporative water cooler being used to supply cold water for cooling during spring or fall afternoons while, at the same time, heat from the collectors is being stored for use during the following night and morning. Heating, with the collectors only or with the heat pump, is considered to be one cycle. Changeover to the heat pump, when necessary, is accomplished automatically by room thermostat control."

Stronger plastic pipe

Plastic pipe has many uses, but caution is wise where high pressures and above-normal temperatures are involved. Fibercast Corp., a subsidiary of Youngstown Sheet & Tube, announces it can supply a pipe that is safe for 1000 psig at 220°F. This is a fiber-glass reinforced, epoxy resin pipe. It is made by a new process. A glass-fiber sleeve is braided or woven around a steel mandrel which is inserted in a casting machine. The mandrel is then removed, resin added, and the mold rotated to build a uniform plastic layer which impregnates and encloses the sleeve. At the same time, it is heated by an oil jacket to cure and harden the resin. The pipe is removed from the mold and cut to desired length. Finally, threads are cast on the ends.

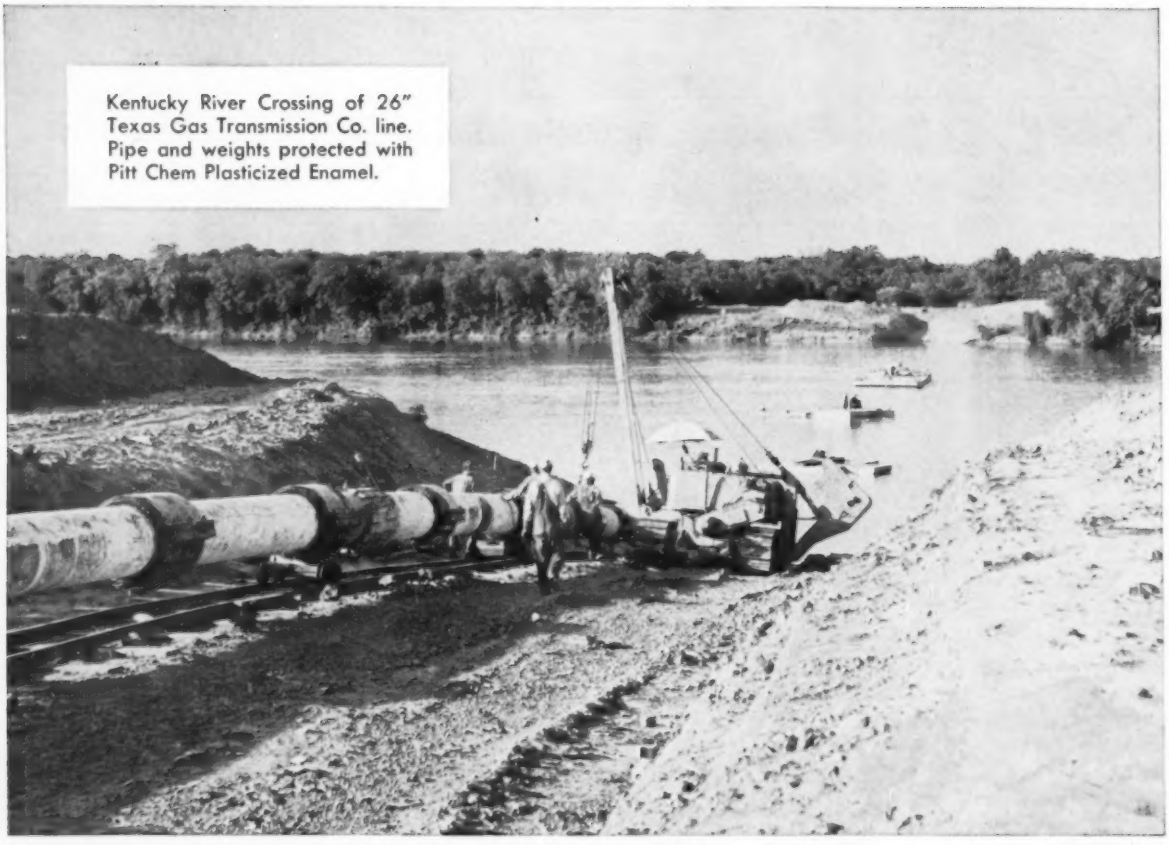
This pipe is particularly useful for handling corrosive liquids. It is claimed to cost less, and weigh only one-fifth as much as corrosion-resistant metal pipe of the same size. Threaded joints are as strong as pipe. At present, 3.5-in. OD is the largest made.

Minnesota Mining & Manufacturing Co. plans to produce a somewhat similar pipe. They say it will withstand 1000 psig at from —65°F to 150°F.

A new stainless steel

U. S. Steel has announced a new stainless steel called USS Tenelon. This name was chosen to point up its high tensile strength and unusual elongation. It does not contain nickel, thus conserving this vital, relatively scarce element. Instead, it carries about 14 per cent manganese and 0.5 per cent nitrogen, with 17 per cent chromium and 1 per cent silicon. This is said to produce better mechanical properties at normal and elevated temperatures, and similar corrosion resistance to conventional 301 and 302, and other, nickel-bearing stainless type steels. It can be shielded-arc welded up to ⅛-in. sheet thickness. It is readily spot-welded.

Beyond the general use of stainless, USS Tenelon may become of interest to the gas industry for heating elements and other critical gas appliance parts. ■



Kentucky River Crossing of 26" Texas Gas Transmission Co. line. Pipe and weights protected with Pitt Chem Plasticized Enamel.

Pipeline Reconditioning Here Could Cost A Fortune!

But Pitt Chem Enamel Assures Long-Term Protection and Low Maintenance Cost

THE extra cost of protecting your pipelines with coal tar enamels may look like pin money a few years from now. For the expense of excessive cathodic protection and reconditioning—which is often necessary when "economy" coatings are used—can sky-rocket your maintenance costs out of all economic proportion.

Coal tar enamels have *proved* their superior ability to resist soil stress and water absorption, the two principal reasons why other coating materials repeatedly fail. So why gamble? Specify *Pitt Chem* Coal Tar Enamels, just as scores of leading pipeline companies do each year, and be sure of minimum maintenance and long-lasting protection.

When you specify *Pitt Chem*, you enjoy the advantages of guaranteed quality, for *Pitt Chem* Enamels are manufactured under rigid production control—to *published* specifications. • How can we help you? Send us the details of your coating problem.

PITT CHEM® TAR BASE ENAMELS

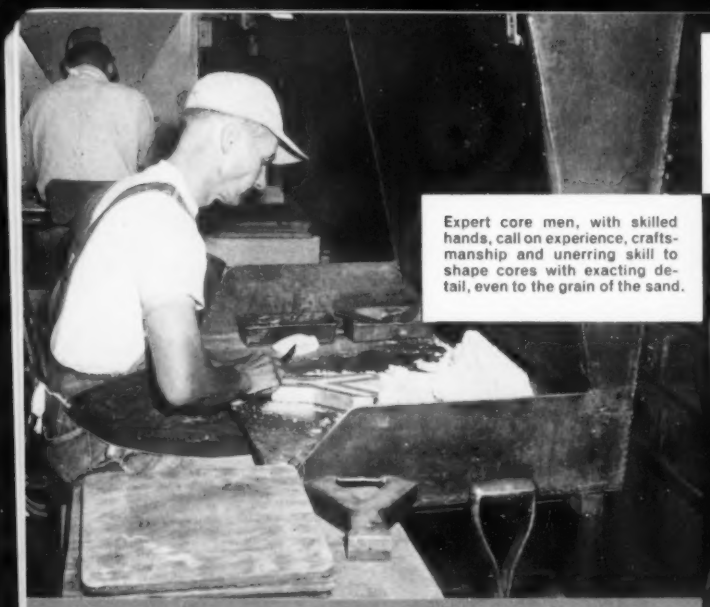
- Standard Grade
- Modified Grade
- Plasticized Grade
- Hotline
- Cold Applied Tar Base Coatings

COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

Craftsmanship . . .

TRADITION OF A CENTURY

Through a century of service, Mueller Co. has established a tradition of fine craftsmanship, with trained workmen utilizing lengthy experience and expert skills... and with exacting control of quality, materials and modern manufacturing methods...to produce superior, more dependable products for the nation's essential gas and water industries.



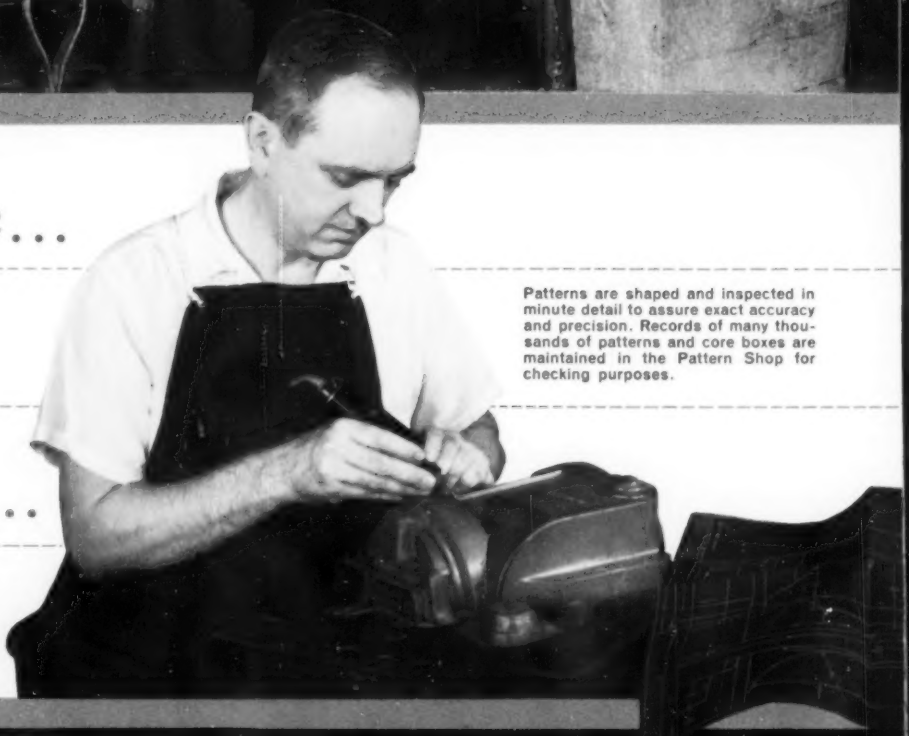
Expert core men, with skilled hands, call on experience, craftsmanship and unerring skill to shape cores with exacting detail, even to the grain of the sand.

Constant temperature checks assure foundrymen that molten metal, which can be accurately maintained within a plus or minus of 10 degrees Fahrenheit, is of the exact heat and proper consistency.

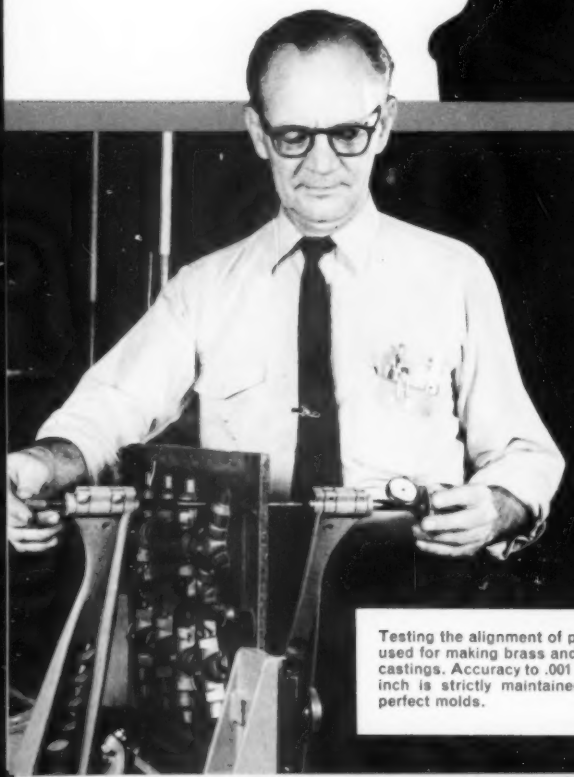
Patience...

Pride...

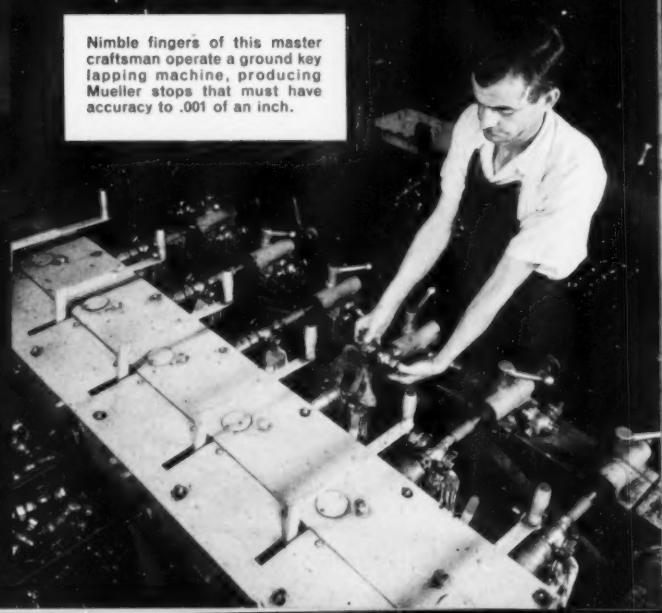
Perfection...



Patterns are shaped and inspected in minute detail to assure exact accuracy and precision. Records of many thousands of patterns and core boxes are maintained in the Pattern Shop for checking purposes.



Testing the alignment of plates used for making brass and iron castings. Accuracy to .001 of an inch is strictly maintained for perfect molds.



Nimble fingers of this master craftsman operate a ground key lapping machine, producing Mueller stops that must have accuracy to .001 of an inch.

Experienced ladlemen jockey ladles into position to receive white-hot liquid brass. Furnaces melt 2,000 pounds of brass in an hour.

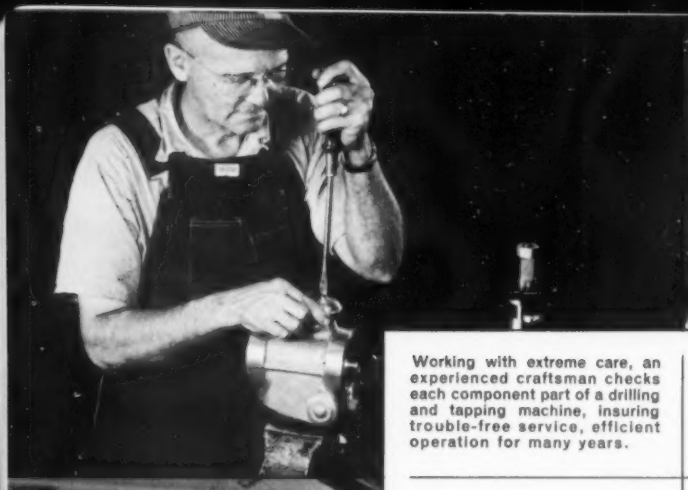
Modern tools are of the utmost importance in fabricating an extension stopper fitting which must be accurate for long-lived ease of operation.

Precision machines cutting gleaming metal to microscopic tolerances... turning conveyor lines carefully carrying partially completed products to assembly points... busy men of many talents adjusting instruments, reading gauges, skilfully performing their work—this is Mueller quality in the making!

Within this vast array of men and machines, every movement has a purpose... each and every man is thoroughly trained for his work, takes great pride in carrying it to perfection. Each part is carefully examined and tested to insure a product of highest quality and the finest workmanship possible... a product that will give long, safe and trouble-free service.

Never-ending patience and great pride in his work guide this machinist as he manufactures thousands of small parts used in Mueller products.

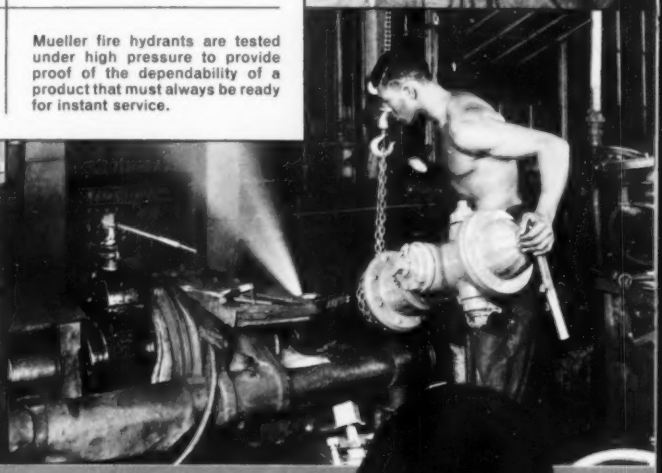
A skilled workman with a steady hand and a "fire-proof" thumb "wipes" a lead gooseneck joint to mirror-smooth perfection.



Working with extreme care, an experienced craftsman checks each component part of a drilling and tapping machine, insuring trouble-free service, efficient operation for many years.

Extensive testing of the Lub-O-Seal, under the scrutinizing eye of an engineering expert, gives the product a final approval. This Lub-O-Seal lost no efficiency after 1,000 high pressure tests.

Watchful eyes and precision machines combine to complete an exacting cut in a stem that will become an integral part of an ever-dependable Mueller Gate Valve.

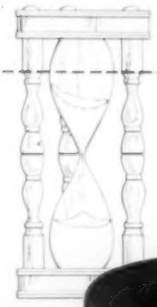


Mueller fire hydrants are tested under high pressure to provide proof of the dependability of a product that must always be ready for instant service.

The final test . . .

When the finished unit leaves Mueller Co., the skill, the care and the quality built into each product must meet one final test . . . a test in which Mueller products have demonstrated superior quality time and time again.

This is the test of the product on the job . . . in the line to stay, giving dependable, efficient, long-lasting service . . . a test which proves that the century-old, Mueller tradition of craftsmanship is worthwhile.



MUELLER CO.

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario

MUELLER CO. 100th YEAR QUALITY SERVING the Water and Gas Industries

DECATUR, ILL.

Since 1857

Just the ticket for those INDUSTRIAL and COMMERCIAL jobs!

ACCURATE!
VERSATILE!
FOOLPROOF!

A compact self-contained economical regulator designed to satisfy 90% of your commercial and light industrial regulator requirements.

For distribution use, it steps up the pressure as the demand increases to deliver gas when you need it.

For safe accurate regulation of large volume commercial or industrial services, use Model 461 as a monitor regulator with Model '1100' as the control regulator. Most of the parts interchange. Both are compact, accurate and versatile.

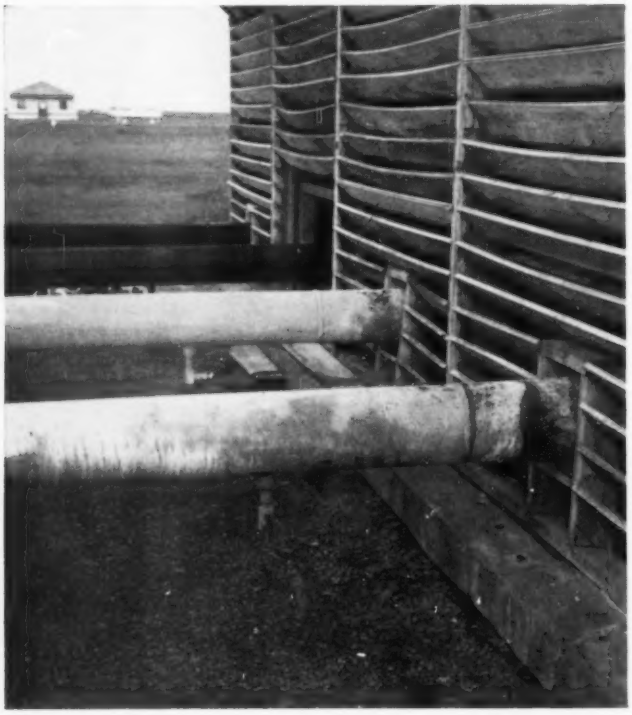
Bulletin 461 gives complete information.

461-1-56

ACCURATE CF MFG CO DEPENDABLE

Chaplin-Fulton
MANUFACTURING COMPANY
Pittsburgh 25, Pennsylvania

TWO-YEAR TEST PROVES "SCOTCHRAP" STOPS CORROSION



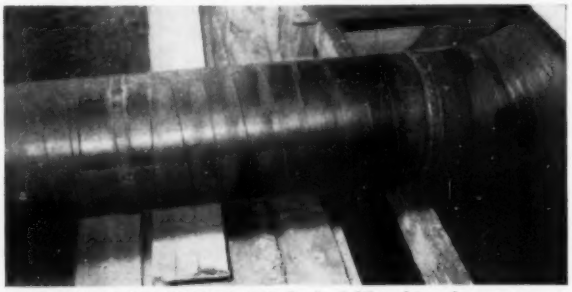
How the test was made:

"SCOTCHRAP" Brand Pipe Insulation really got an "acid test" in this installation. In the photo at left, the two far pipes feeding into a compressor station cooling tower were covered with "SCOTCHRAP" Pipe Insulation . . . the near pipes were protected with the best available paint. From March 23, 1954, when the "SCOTCHRAP" and paint applications were made, until April 4, 1956, when the insulation was removed and these photos taken, these pipes were subjected to spray of the acid and chlorine bearing water from the tower, as well as sunlight and weathering. Average operating temperature of the pipes was 150° F.

• • • • •

After TWO YEARS, "SCOTCHRAP" protection is still perfect!

UNPROTECTED PIPE shows the effects of the corrosive action of the water splash from the cooling tower. Severe scaling and pitting are evidenced, and these pipes must be replaced. Water was highly corrosive due to acids and chemicals used for scale and algae control.



"SCOTCHRAP" COVERED PIPE looked like this when unwrapped — so perfectly intact you can still see the imprint of the "SCOTCHRAP" Adhesive on the prime coat. When prime coat was scraped away, pipe metal underneath was shiny, sound, good as new!

● If you have corrosion problems, why not let us send you the complete story on "SCOTCHRAP" — the tough, pressure-sensitive polyvinyl-chloride tape that gives complete corrosion protection. Just write on your letterhead to 3M Co., St. Paul 6, Minn., Dept. CT-67.

Reg. U.S. Pat. Off.

SCOTCHRAP
BRAND
PIPE INSULATION

The term "SCOTCHRAP" is a registered trademark of Minnesota Mining and Manufacturing Co., St. Paul 6, Minn. Export Sales Office: 99 Park Avenue, New York 16, N. Y. In Canada: P.O. Box 757, London, Ontario.

PRODUCT OF 3M COMPANY RESEARCH

Made of malleable iron. Single massive bolt. All sizes, 1/2" to 12" inclusive. For steel, cast iron and Transite pipe.

M. B. SKINNER COMPANY

SOUTH BEND 21, INDIANA, U. S. A.

SKINNER-SEAL SERVICE SADDLE

NOW Call L. B. FOSTER CO. for

SEAMLESS ALLOY PIPE

SEAMLESS CARBON PRESSURE PIPE

PVC PIPE* VALVES-FITTINGS

*Polyvinyl-Chloride

Foster offers pipe buyers more complete warehouse service—including three new specialties—Seamless Alloy Pipe, Seamless Carbon Pressure Pipe and PVC Pipe, Valves and Fittings. Initial stocks are in our warehouses—immediately available for "Faster-from-Foster" service.

Now, anywhere in the country, when you need pipe, try L. B. Foster Company. We specialize in unusually large quantities, unusually large sizes, the hard-to-get items. Our regular stocks include all types of pipe—seamless, welded, carbon and alloy, prime tested and structural in all sizes ⅛" thru 36", and aluminum pipe. Catalogs are available.

Call your nearest Foster office today.

PIPE · RAILS · STEEL-SHEET PILING · PIPE PILES · H-BEARING PILE · VALVES & FITTINGS

SINCE 1901 **L.B.FOSTER CO.**

PITTSBURGH · NEW YORK · ATLANTA · CHICAGO · HOUSTON · LOS ANGELES

WASHINGTON

Gas bill backers work overtime for approval

By NEIL REGEIMBAL
GAS Washington Bureau

BACKERS of the new Harris-O'Hara natural gas bill have been working overtime to try to push the controversial measure through Congress this year.

The most important opposition to the measure began to develop in the closely divided House shortly after is was introduced. There is opposition in the Senate too, but most backers believe there is a "safe" margin by which to pass the upper chamber.

The bill is particularly splitting Democratic ranks, although Republican support is by no means solid despite the President's endorsement. Some dissension in the ranks of the gas industry—among some distributors and some independent producers— is also a problem to the bill's sponsors.

The bill has been criticized by some producers because of a provision prohibiting state or local governments from regulating the price of gas headed for interstate movement.

Provisions of the new bill (H.R. 6790) outlawing most types of escalation clauses and giving FPC control over "indefinite" pricing clauses have also been criticized.

The Harris-O'Hara bill does not differ much from the measure drafted by an informal group of representatives of producers, pipelines, and distributors earlier in the year.

Opponents of the measure have blasted its provisions permitting market prices as a complete "lack of regulation." First gun to sound from the opposition was fired by Sen. Alexander Wiley (R.-Wis.).

The Senator termed the measure "even worse" than the Harris-Fulbright bill vetoed last year. He said that the legislation would establish only a "pretense" of regulation, and that the "reasonable market price" provision is a gimmick to permit price increases. The bill's supporters, he added, had the same aim now as they did last year: "To deny the consumers of this nation the reasonable protection which the consumers had a right to expect under the Natural Gas Act of 1938."

Opponents claim that the bill would force the Federal Power Commission to follow the market price, rather than lead it. Just how important that argument will be is open to some question. President Eisenhower's main point in supporting a gas bill is to remove government utility-type controls from production facilities.

Reports from Capitol Hill indicate that representatives of gas interests supporting the bill are being extremely circumspect as they attempt to "get the facts to congressmen"—lobbying, as it's officially termed. They don't want a repetition of last year's fiasco.

Trans-Canada fight brewing in Congress

THE Trans-Canada gas pipeline project, which stirred up extremely bitter controversy among Canadians because of American influences, is now beginning to create American opposition.

The opposition, mostly from coal-producing areas, is being voiced in Congress by Reps. John P. Saylor, (R.-Pa.) and Cleveland M. Bailey, (D.-W. Va.).

Bringing Canadian gas into U.S. Markets would create "gas chambers to bring sudden death to the economy of mining towns," says Representative Bailey.

Permitting foreign fuel "peddlers to invade" American markets cannot be justified, he says. He is particularly critical of midwestern congressmen for attempting to influence the Federal Power Commission to "grease the way" for pending pipeline applications to import Canadian gas.

Representative Saylor says permitting importation of the Canadian gas would create an "economic tragedy." It would make a "vital part of America's defense efforts" dependent on a foreign power, he adds.

He also complains that the price to be charged for the Canadian gas will be "in the hands of gas people on the other side of the border," and argues that some of the backers in Congress of the import plan voted against the Harris-Fulbright bill in order to retain controls over U. S. gas producers.

The two congressmen are sponsoring identical bills in Congress to impose an import tax of 10 cents/Mcf in the hope that the tax would price the Canadian gas out of the U. S. market.

No action has been scheduled on the bills. ■

From well head

All of your measurement and control

Now, your American® representative can supply you with OIC valves and provide all the equipment required to measure, regulate and control gas flow from well head to burner tip. Working together, American's complete family of precision designed and engineered products, and OIC valves, bring you maximum efficiency, low maintenance cost and trouble-free service.

OIC LUBRICATED PLUG VALVES assure pressure-tight seating — dependable operation.

OIC Triple-Seal Valves

OIC lubricated plug valves are precision designed and engineered with an exclusive triple-seal to provide positive shutoff. OIC valves are stocked in quantity by American Meter Company, assuring prompt delivery.

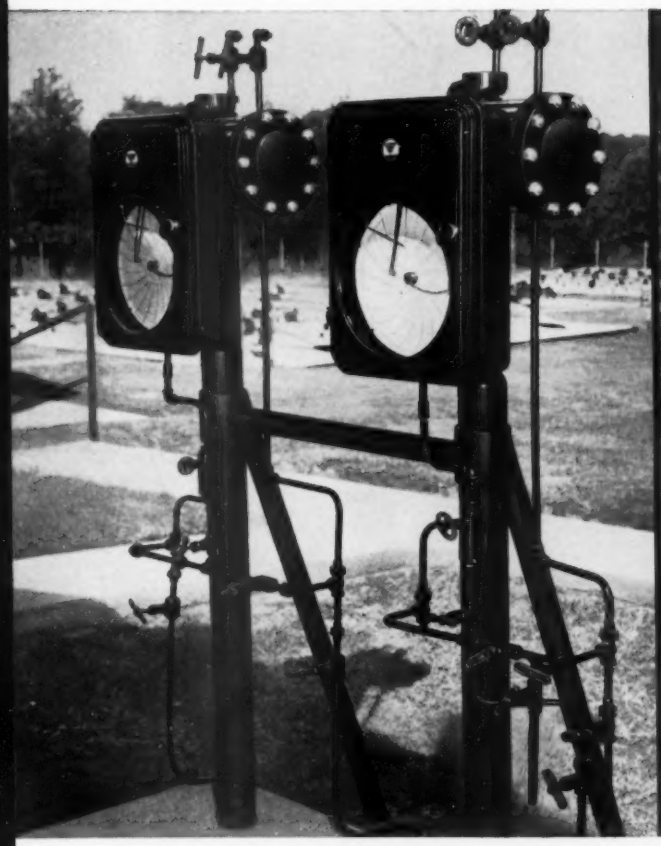
OIC VALVES

FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON VALVES

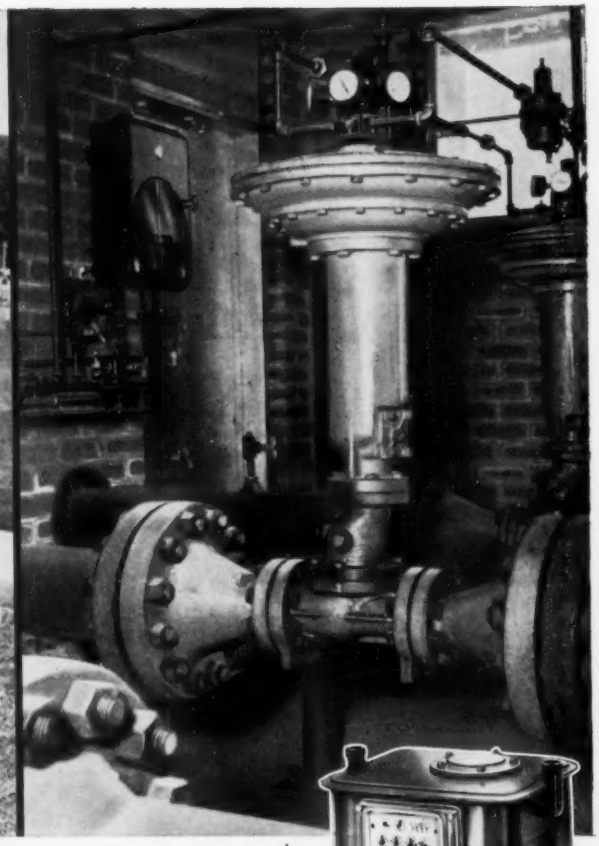
Distributed to the Gas Industry by .....

to burner tip...

equipment from one dependable source

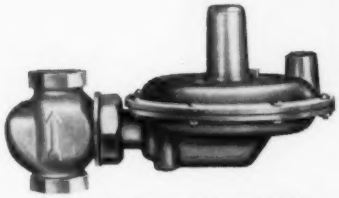


AMERICAN DRI-FLO METERS provide precision measurement of large gas volumes.



RELIANCE TYPE "P" REGULATORS reduce and accurately maintain system pressures.

AMERICAN WELDED STEELCASE METERS assure new economies in displacement meter measurement.



RELIANCE 1400 SERIES REGULATORS maintain precise pressure to appliances.

American's Complete Line

American Meter Company has pioneered the advancement of all phases of gas measurement, regulation, control and testing of gases for more than 120 years. Today, American provides a complete line of meters, regulators, instruments, valves, test meters and apparatus for the Gas Industry.

For prompt engineering assistance and equipment for all of your measurement, regulation and control problems, consult your American Meter representative.

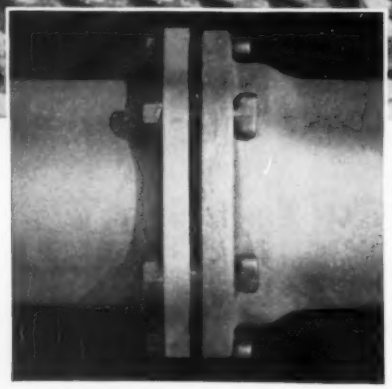
AMERICAN® METER COMPANY

INCORPORATED (ESTABLISHED 1836)

GENERAL SALES OFFICE: Philadelphia 16, Penna.
Albany • Alhambra • Atlanta • Baltimore • Birmingham
Boston • Chicago • Dallas • Denver • Erie • Houston
Kansas City • Los Angeles • Minneapolis • New York
Omaha • Pittsburgh • San Francisco • Seattle • Tulsa • Wynnewood
IN CANADA: Canadian Meter Company, Ltd., Milton, Ontario
Calgary • Edmonton • Regina

SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters, • American-Westcott Orifice Meters, • Instruments • Reliance Regulators • Apparatus • Valves

CAST IRON PIPE...



MECHANICAL JOINT

CAST IRON

Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, Suite 3440, Prudential Plaza, Chicago 1, Ill.

cast iron

ALWAYS AVAILABLE, ALWAYS DEPENDABLE

No periodic shortages to slow down construction

Why wait and worry? When new construction is needed, specify cast iron and relax. Cast iron pipe will be ready when you are. To availability, add dependability. Cast iron is America's longest lasting pipe.

Proof? 40 American gas companies still use cast iron gas mains laid over a century ago! Mains with 50 and more years of service are common.

Today, *modernized* cast iron pipe, centrifugally cast, is even tougher, more efficient. Standardized mechanical joints are bottle-tight under all gas pressures . . . and for all types of gas. Wall thicknesses are uniform. Joint design allows deflection during and after installation. Service lengths and ample variety of standard fittings cut time, labor in congested undergrounds.

For dependability, long life, long-term economy, specify cast iron.

Installed as part of Chicago's gas system in 1850, this 4-inch cast iron pipe was finally retired. Upon examination, after more than 100 years of continuous underground service, it proved to be in excellent condition. Here's another example of cast iron pipe's long range reliability and economy. It pays to specify cast iron pipe . . . especially today. *Modernized* cast iron pipe is even more rugged.

A FEW OF THE 40 GAS UTILITIES WITH CENTURY-OLD CAST IRON MAINS IN SERVICE

Peoples Gas Light and Coke Co., Chicago—Baltimore Gas and Electric Co.—Philadelphia Gas Works—Richmond Gas Works, Richmond, Va.—Hartford Gas Company, Hartford, Conn.

pipe FOR MODERN GAS DISTRIBUTION

New capacity!

The completely new Forward Control 'Jeep' FC-150—the first time a 4-wheel-drive Truck has so effectively combined maximum cargo capacity with exceptional maneuverability! New Forward Control design puts a 74" pickup box on an 81" wheelbase. And the FC-150 retains famous 'Jeep' ruggedness and versatility.

New maneuverability!

It's the world's shortest turning 4-wheel-drive Truck! For safer off-road maneuverability, it gives you up to 200% greater forward visibility. Powered by the engine that made 'Jeep' vehicles famous, the new FC-150 provides the extra traction of 4-wheel drive for off-road travel, shifts into 2-wheel drive for highway travel.

New style!

The new look and feel of tomorrow! The FC-150's Safety-View Cab combines beauty with utility. Its new wrap-around windshield is the largest in the 5,000 GVW class. There's plenty of extra leg and head room. Here is new styling, comfort, convenience and safety all in today's most advanced 4-wheel-drive Truck.

New 'Jeep' 4-Wheel-Drive Forward Control FC-150

Willys...world's largest makers of 4-Wheel-Drive vehicles

.other members of the famous 'Jeep' family:

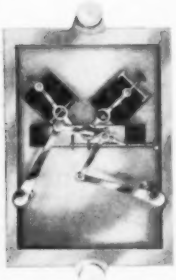
Universal 'Jeep' | 'Jeep' Truck | 'Jeep' Utility Wagon

See 'Jeep' vehicles at your **WILLYS** *dealer*

IF YOU HAVE CLEAN GAS...

You save twice with SUPERIOR'S OPEN-TOP METER

1. LOWER FIRST COSTS
2. LOWER REPAIR COSTS



Superior's Open-Top Meter

Valves and moving parts immediately accessible under cover. Sizes 80 to 425 cfh.

Superior's Closed-Top Meter

Recommended for manufactured and mixed gas, and for larger sizes. Capacities 150 to 7500 cfh.

Send for new Bulletin No. 1100

Here is a meter that offers a genuine two-fold saving. Today's clean natural gas, together with many refinements in Superior's design, now make it possible to omit one piece of metal and eliminate a major soldering operation. This means lower first cost . . . with more savings for you every time you open the meter in the decades ahead.

The Superior open-top design replaces the time-honored soldered back plate with a new open-bridge construction. Valves and all above-table working mechanisms are easily accessible as soon as the top is removed. For proving and valve adjustments, a hand-hole plate in the top cover is available. A special stuffing box on the index shaft prevents escape of gas should index glass be broken. Top edges of the main case are extra wide so that the cover can be made smaller. This makes it easier to do a surer, safer soldering job, particularly around the pipes.

Write today for full details.

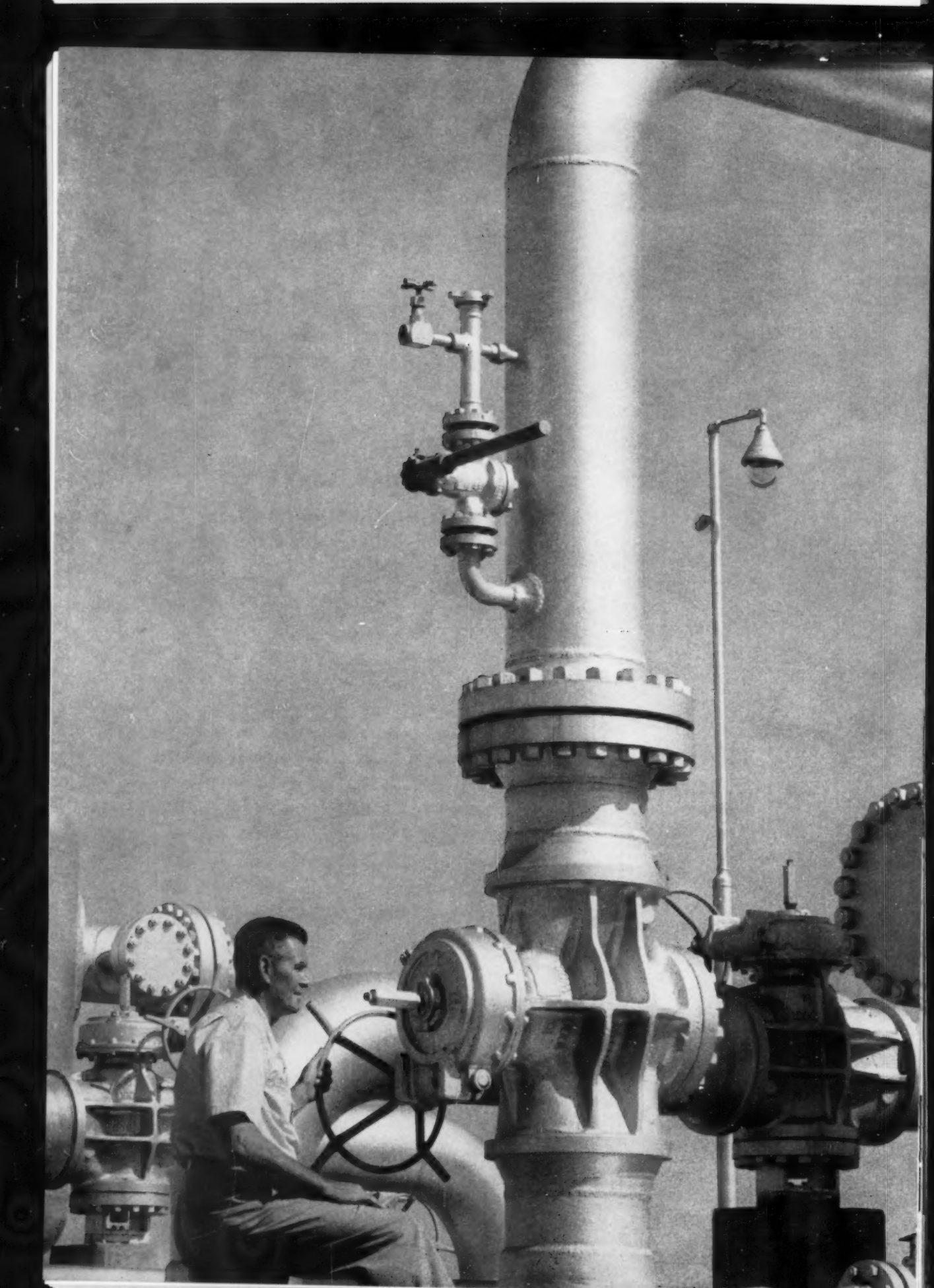
superior
GAS METERS

SUPERIOR METER COMPANY, INC.
19 West 50th St., New York 20, N. Y.

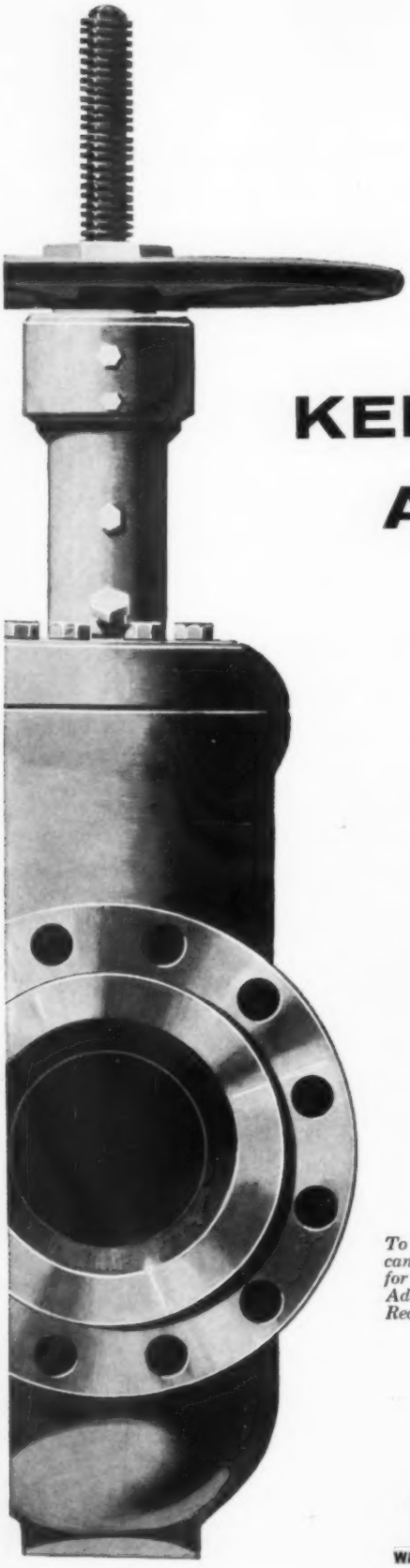
A SUBSIDIARY OF NEPTUNE METER COMPANY

SALES OFFICES: Atlanta, Boston, Chicago, Dallas, Denver, Los Angeles, Louisville, No. Kansas City, Philadelphia, Portland, Ore., San Francisco (Millbrae)

SU-6



ROCKWELL-Nordstrom lubricated plug valves are used in more natural gas transmission, storage and distribution installations than any other valve. Why? They shut-off tighter, stay in service longer and insure better flow control at lower cost. When you specify Rockwell-Nordstrom valves you also specify safety, dependability and economy.
Rockwell Manufacturing Company, Pittsburgh 8, Pa.
Canadian Valve Licensee: Peacock Brothers Limited
ROCKWELL-Nordstrom VALVES
Lubricant Sealed For Positive Shut-Off
ROCKWELL



how Ebasco helps the gas industry

KEEP SALES AT HIGH LEVELS

ARE YOU now realizing the greatest sales potential from your market area?

ARE YOU developing the demand for additional gas service through proven promotion methods?

ARE YOU using sales techniques that help keep the load evenly distributed throughout the year?

ARE YOU employing a program that will maintain favorable public opinion?

The answers to these questions are vital to the future growth and prosperity of your company. And Ebasco, with long experience in all phases of utility operation, is able to supply them. Ebasco specialists will study markets and trends, will offer tested advertising and promotion ideas, will help with your sales organization structure, public relations program and sales training.

Backed by over 50 years of association with utilities of all sizes, Ebasco can provide a skilled, objective viewpoint to supplement the activities of your own personnel.

To find out what Ebasco sales and public relations service can do for your company to keep sales at high levels write for our booklet—"The Inside Story of Outside Help". Address Ebasco Services Incorporated, Dept. F., Two Rector Street, New York 6, N. Y.

NEW YORK
CHICAGO
DALLAS
PORTLAND, ORE.
SAN FRANCISCO
WASHINGTON, D. C.

EBASCO — ENGINEERS · CONSTRUCTORS · BUSINESS CONSULTANTS

Appraisal • Consulting Engineering
Design & Construction
Financial & Business Studies
Industrial Relations
Insurance, Pensions & Safety
Purchasing, Inspection, Expediting
Rates & Pricing • Research
Sales & Public Relations
Space Planning
Systems, Methods & Budgets
Tax • Washington Office

SCRUBOSPHERE*...

...FOR *Cleaner Gas* AT *Less Cost!*

***PEERLESS SPHERICAL DUST and LIQUID SCRUBBER FOR GAS PIPELINES**

(A) The majority of incoming liquid and solid particles are directed down into reservoir. 1

(B) Lighter solid particles carried by gas stream are separated on surfaces of contactor which are kept wet and clean by revolving thru liquid reservoir. 2

(C) Contactor is revolved by explosion-proof gear motor.

(D) Mist Extractor removes any remaining liquid particles from gas stream prior to outlet. 3

- The **dust removal ability** of the SCRUBOSPHERE **is superior** because it utilizes wetted surfaces for dust collection which are much more closely spaced than in conventional equipment.
- **Oil loss is minimized** because the oil used to wet the dust collecting surface is lifted mechanically instead of bubbling gas through the oil which results in foaming and loss due to creation of hard-to-separate fine particles.
- **Maximum performance and low cost** — The spherical design means high capacity and performance because it provides maximum dimensions for the contactor and mist extractor which normally are limiting factors in scrubber designs. The vessel cost is reduced because required vessel thickness is only one half that required for cylindrical vessel of same diameter.
- **Versatility** — separates solid and liquid particles with equal efficiency.
- **Low pressure drop** — ½ to ¾ psi at rated capacity depending on nozzle size.

PEERLESS MFG. CO. DALLAS TEXAS

PEERLESS MANUFACTURING CO.

P. O. BOX 13165 DALLAS, TEXAS

Representatives in All Principal Cities

Write for test data showing dust removal and oil loss of Peerless Scrubosphere as against conventional dust scrubber.

16" Mechanical Joint Cast Iron Pipe for 8,000 foot feeder gas main in Illinois.

how long is long life?

With most products, it's a few years. With cast iron gas mains, a century and more of continuous service is common.

Proof? Old cast iron mains installed by 40 American gas utilities a hundred years and more ago are still being used. Hundreds more throughout the nation have passed their 50 year milestone in service. Each year adds to the total.

Cast iron might rest there. But modern metallurgy is producing even better pipe—the modernized cast iron pipe being centrifugally cast today.

Tougher, stronger, modernized cast iron pipe offers the gas industry long term economy and performance unequalled by any other pipe. Also it is ready for prompt shipment.

Count on Cast Iron for Service

- Standardized mechanical joints are bottle-tight for usual gas pressures . . . and for all types of gas.
- Centrifugally cast pipe is tough, strong and uniform.
- Joint design allows for deflection during and after installation.
- Service connections are easily made.
- Long life a matter of record.
- No shortage. Cast Iron Pipe is immediately available.

U.S. cast iron PIPE

U. S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

A WHOLLY INTEGRATED PRODUCER
FROM MINES AND BLAST FURNACES TO FINISHED PIPE.

An important step towards good customer relations

NEAT, ATTRACTIVE ROCKWELL ALUMINUM METER SETS

The meter set is your company's representative on the customer's property. Meter sets can be in good taste . . . cleanly piped, well located, fabricated with modern components to reflect credit on the quality of your service. Or they can be ugly eye sores.

Do your meter sets compliment the progressive gas industry? Do they match the appearance of the new homes you are serving? Do they belong in contemporary basements or landscaped yards? Rockwell aluminum meter and regulator sets do!

Their eye appealing lines win customer acceptance . . . give the rightful impression of better service and protection from your use of the finest, safest equipment.

ROCKWELL MANUFACTURING COMPANY

PITTSBURGH 8, PA. Atlanta Boston Charlotte Chicago Dallas Denver Houston Los Angeles Midland, Tex. New Orleans New York N. Kansas City Philadelphia Pittsburgh San Francisco Seattle Shreveport Tulsa In Canada: Rockwell Manufacturing Company of Canada, Ltd., Toronto, Ontario

ROCKWELL GAS METERS AND REGULATORS

THE precision with which measurement and control equipment performs depends to a large extent on the dimensional exactitude to which parts and assemblies are controlled.

The high degree of sensitivity and stability in Rockwell meters and regulators come from the use of advanced design principles, modern materials and many exclusive manufacturing developments.

ACCURACY

...that lasts, for the longest life, at the lowest cost

To maintain accuracy, Rockwell has invested millions in plants and laboratories. Automatic machines, precision tooling and testing take the guesswork out of manufacture. And by grouping the production of related products in separate plants, a closely coordinated measure of quality control is achieved.

The end result is that Rockwell customers get the maximum in accuracy and durability from their measurement and control equipment plus trouble-free performance and low, low maintenance costs. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

FOUR WAYS IN WHICH ROCKWELL EXCELS

RESEARCH • SAFETY • ACCURACY • SERVICE

ROCKWELL GAS METERS AND REGULATORS

"Those Galvomag anodes give us the added punch we need for our high-resistivity soil"

If you've got an underground corrosion problem, Galvomag® magnesium anodes are almost always the best solution.

Galvomag, the Dow high-potential anode that delivers 25% more current than conventional anodes, gives continuous protection to underground equipment—and it's easy on your maintenance budget. These more powerful anodes also provide extra punch and throwing power in high-resistivity soils. In normal soils they insure against corrosion with fewer anode units. Either way, you save on your original investment for cathodic protection.

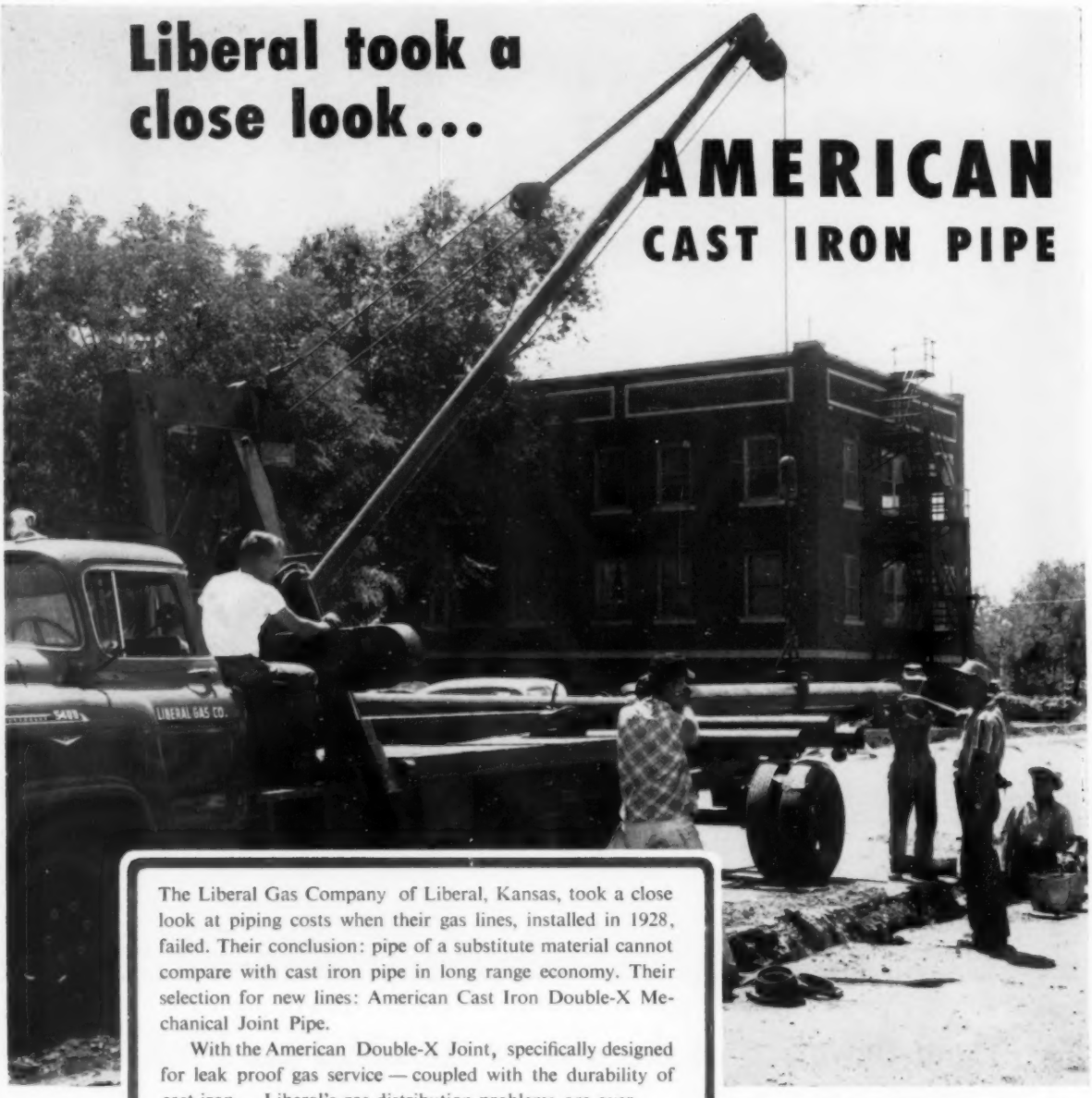
Contact one of the Dow magnesium anode distributors listed below for detailed information and technical assistance, or write directly to us. THE DOW CHEMICAL COMPANY, Midland, Michigan, Department MA 1428JJ-I.

Call the distributor nearest you: **Cathodic Protection Service, Houston, Texas • Corrosion Services, Inc., Tulsa, Oklahoma • Electro Rust-Proofing Corp. (Service Division), Belleville, N. J. • Ets-Hokin & Galvan, San Francisco, Calif. • The Harco Corp., Cleveland, Ohio • Royston Laboratories, Inc., Blawnox, Penna. • Stuart Steel Protection Corp., Plainfield, N. J. • The Vanode Co., Pasadena, Calif.**

YOU CAN DEPEND ON DOW

Liberal took a close look...

AMERICAN CAST IRON PIPE



The Liberal Gas Company of Liberal, Kansas, took a close look at piping costs when their gas lines, installed in 1928, failed. Their conclusion: pipe of a substitute material cannot compare with cast iron pipe in long range economy. Their selection for new lines: American Cast Iron Double-X Mechanical Joint Pipe.

With the American Double-X Joint, specifically designed for leak proof gas service — coupled with the durability of cast iron — Liberal's gas distribution problems are over.

The durability of cast iron pipe is proved by a century-long record of service in more than seventy American cities. This record is unequalled by pipe made of any other material. Because cast iron pipe lasts longer and requires fewer repairs and replacements, the annual cost over the life of the pipe is undeniably lower.

Take a close look at all the factors affecting piping economy when you specify pipe. Your American representative will be glad to supply facts for your consideration.

Liberal Gas Company installing Double-X mechanical joint pipe in Liberal, Kansas, replacing substitute pipe installed in 1928.

SALES OFFICES

Kansas City • Denver
Minneapolis • Dallas
Pittsburgh • Orlando
New York • Cleveland
Los Angeles • Birmingham
San Francisco • Chicago

AMERICAN CAST IRON PIPE CO.
BIRMINGHAM 2, ALABAMA

Multiple Port, 100% Pipe Area or Venturi

Diamond Port or "V" Port for Throttling

Round Port 100% Pipe Area

Rectangular Port 100% Pipe Area

Rectangular Port Venturi

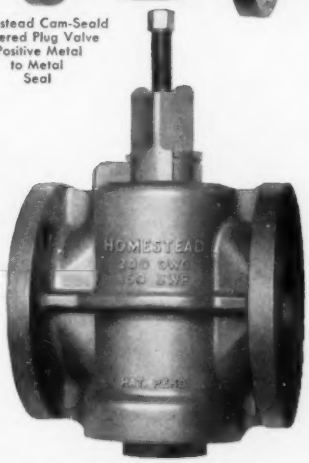
HOMESTEAD

offers you one source for

ALL TYPES OF PLUG VALVES

ALL TYPES OF PORT OPENINGS

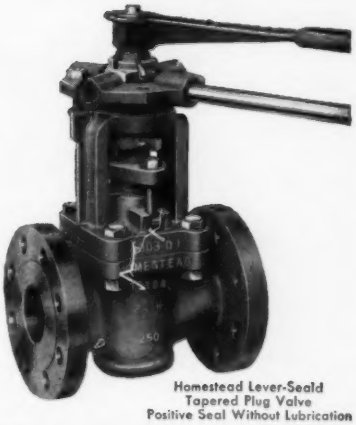
Homestead Cam-Seald Tapered Plug Valve Positive Metal to Metal Seal



Homestead Lubricated Plug Valve High Pressure Chemical Seal

Name the type of valve you need in the metal or alloy you require with the port opening you want—and we can furnish it. Or if you have a valve problem that defies solution, write us, naming the fluid, concentration, temperature, pressure, valve size, function and frequency of operation. We will be happy to recommend the best and most economical valve for your service conditions.

For complete information on Homestead Plug Valves



Homestead Lever-Seald Tapered Plug Valve Positive Seal Without Lubrication

MAIL THE COUPON NOW!

Please send me information on the following Homestead Plug Valves:

☐ Lubricated ☐ Lever-Seald ☐ Cam-Seald

Name_____ Title_____

Company_____

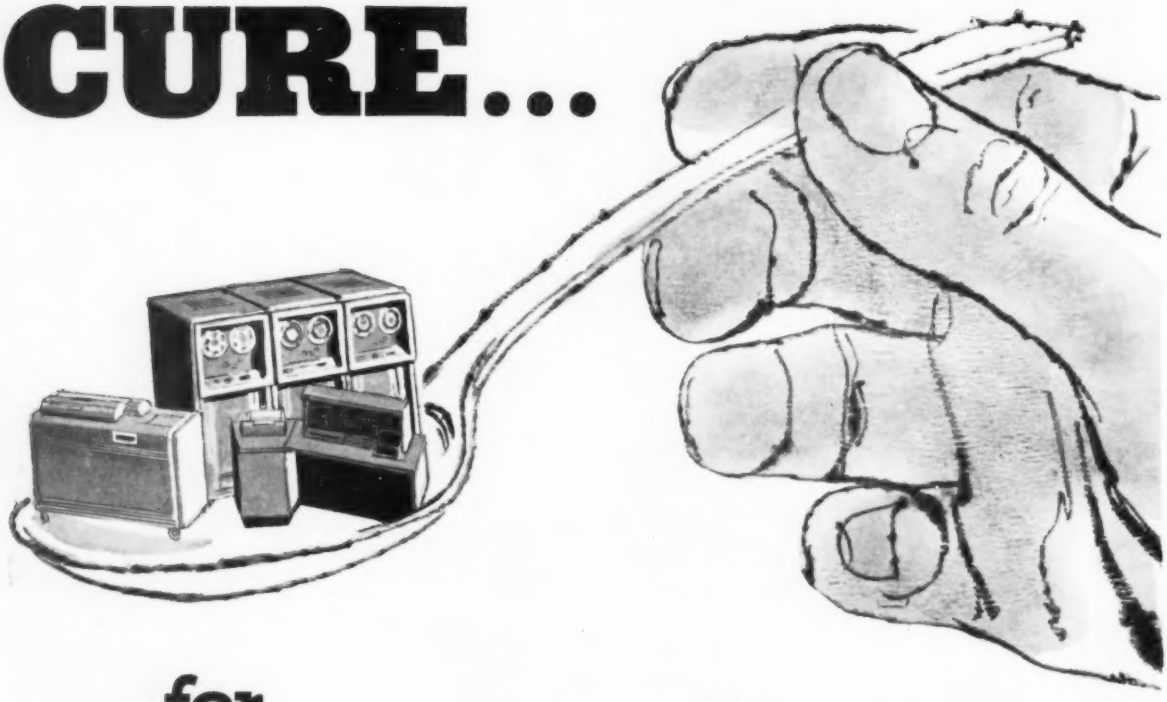
Address_____

City_____ State_____

HOMESTEAD VALVE MANUFACTURING COMPANY

P.O. Box 405 *"Serving Since 1892"* Coraopolis, Pa.

CURE...



for public utility growth problems

IBM DATA PROCESSING

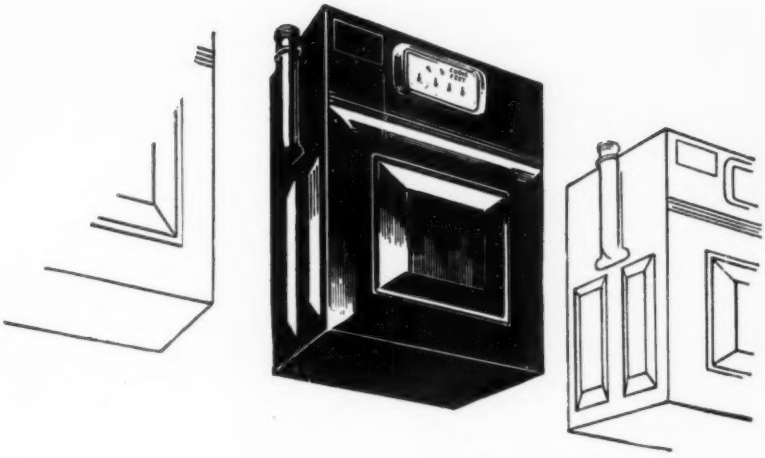
- DATA PROCESSING
- ELECTRIC TYPEWRITERS
- TIME EQUIPMENT
- MILITARY PRODUCTS

• To keep service up . . . and costs down . . . in today's rising tide of public utility growth, more and more companies depend on the speed and accuracy of IBM electronic data processing systems to eliminate growth problems.

• One large utility company, for example, has already saved some $70,000 on payroll and stock dividend applications through the use of its IBM 705.

• In the face of your growth, too, IBM systems not only maintain the great service tradition of public utilities, but actually smooth out procedures . . . step them up. Moreover, they can solve your complex engineering problems, freeing valuable engineering talent for more creative work. And expanding customer billing, payroll, other routine accounting jobs are done more easily, swiftly, accurately.

• Whether your problems are in accounting *or* engineering, your IBM representative brings the full weight of IBM's 43 years of experience and *proven* performance to bear on them. Why not phone him today? Or write: Public Utilities Department A57, International Business Machines Corporation, 590 Madison Avenue, New York 22, New York.



GAS

JUNE 1957

Proving domestic gas meters with pressure, vacuum methods

By ALLEN D. MacLEAN, Chief Engineer
Superior Meter Co., Punxsutawney, Pa.

THE principle of measurement in the diaphragm gas meter is based entirely on displacement. Therefore, to check a meter for accuracy, it is necessary to compare its displacement registration at the meter index with an accurately known displacement that can be visibly indicated. The device usually used in this process is called a gas meter prover. The schematic layout of such a test device is shown in *Fig. 1*.

The principle of the meter prover is that of a hollow vertical bell lowered into a liquid body, which forms a seal. As the bell descends into the liquid, air is displaced from the inside of the bell and if the inside area of the bell is accurately known and the distance which the bell descends vertically into the liquid is carefully measured, this displacement can be determined by multiplying the inside area of the bell by the distance descended into the liquid. A scale can be attached to the bell which by referring to a pointer, indicates the exact amount of descent. By proper computation, this scale can be graduated in cubic feet and fractions thereof.

A meter can be connected directly to the bell outlet and the accurately measured displaced gas can be made to pass through the meter. The reading of the meter index can then be compared to the reading of the bell scale and the meter can be thus checked for accuracy.

In actual operation instead of measuring or computing the bell's internal diameter in making the scale, the displacement of the bell is compared to the displacement of a cubic foot bottle. This device (*Fig. 2*) displaces one cubic foot when lowered into a liquid seal with a high degree of readable accuracy, because of the narrowed area at the ends of the "bottle." The initial calibration of this cubic foot bottle is performed by the U. S. Bureau of Standards, based on accurately weighing water contained in the cubic foot space and then adjusting a marker on the bottle neck to designate 1 cu ft. This cubic foot as determined by the cubic foot bottle is transferred to the scale on the prover bell, by connecting the bottle to the bell and moving the air from one to the other. This must be done under ideal conditions of temperature and humidity and both the prover bell and the bottle must be very accurately balanced so that at the start and end of each run of a cubic foot, the pressure in the bell is exactly atmospheric. This operation is repeated throughout the capacity of the scale of the prover.

After the scale has been accurately marked, the lines are either machined or etched on the scale with

GAS exclusive

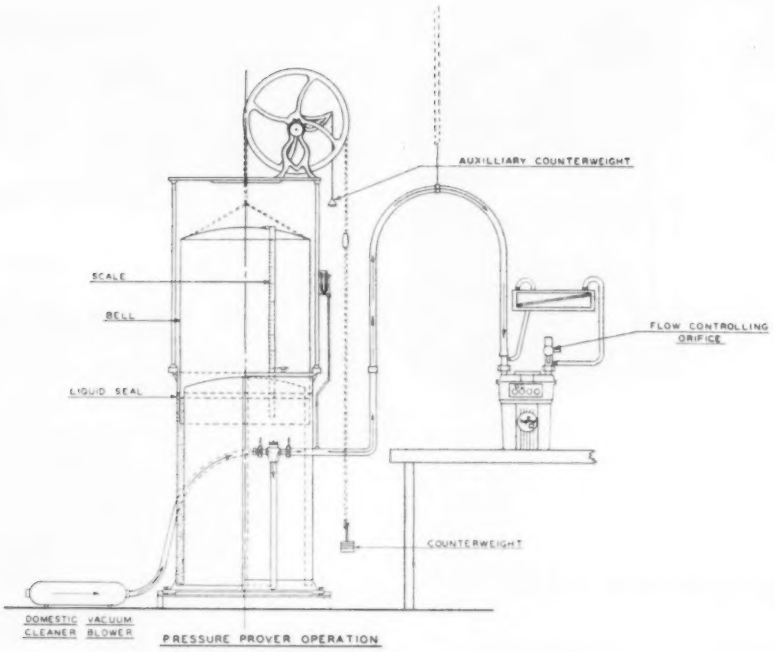


Fig. 1. Schematic layout of gas meter prover.

appropriate .5- and .10-ft lines interpolated by measurement.

There are several points to be observed in the use of a prover. To accurately control the weight of the bell and its supporting chain, there is provided an adjustable counter weight to partially balance the bell's weight. The American Gas Association specifies that the excess weight of the bell over the counterweight be sufficient to give a pressure in the bell of 1.5 in. of water column.

The capacity rate of a domestic gas meter is designated as the rate of flow in cubic feet per hour of .64 specific gravity gas which will pass with a .5-in. wc pressure loss across the meter. Thus, the 1.5-in. wc pressure as generated by the prover is sufficient to operate the meter considerably above the meter capacity rate.

Obviously, it is desirable to hold this 1.5-in. wc pressure exact at all positions of the bell from top to bottom. There are two factors which tend to disrupt this even pressure throughout the stroke; first, the actual weight of the bell supporting chain or cable which passes over the balancing pulley. As the bell comes down, the weight of the chain on the bell side of the balancing pulley tends to increase the weight on that side and decreases the weight on the counterweight side. The converse is true as the bell travels upward. Second, as the bell descends into the liquid, the buoyancy effect of the liquid increases since more of the bell's shell is immersed. The buoyancy effect is equal to the weight of liquid displaced by the shell of the bell.

To counteract these two unbalancing effects, an auxiliary small counterweight is attached to the balancing pulley shaft acting over a specially designed cam. As the bell descends from its top position to the bottom, the balancing wheel rotates counterclockwise and the cam, being a curve called the "Spiral of Archimedes" moves the effective radius of the counterweight inward proportionally so that the counter-balance effect of the small weight decreases by the same amount as the increase in buoyancy and the change in position of the supporting chain. Thus, exactly the same pressure is generated by the bell during its total stroke from top to bottom.

Friction of the moving parts also affects the pressure as generated by the bell, but since this friction is always opposite the direction of motion, it cannot be eliminated. It is, however, minimized by using guides and bearings with the least possible friction.

There are two methods used in proving gas meters, the first is the pressure method, in which the prover is weighted as described above to give a 1.5-in. wc pressure above atmosphere to operate the meter; the second method is to arrange the prover for vacuum instead of pressure; air is then drawn from atmosphere into the meter through the meter outlet connection into the prover bell.

To obtain this vacuum effect, the large counterweight in *Fig. 3* is increased in size until it pulls the bell upward so that 1.5 in. of water column below atmospheric pressure (vacuum) is generated in the bell. The scale is, of course, reversed, so that the zero point is at the top of the scale, increasing in reading as the bell raises.

The pressure method has been used in the past in the majority of installations. However, due to the increasing use of open top tin meters, and hard case (iron and aluminum) meters, the vacuum method is being used by an increasing number of companies.

The majority of meters in the past were "closed top" tin meters, which were developed during the

era of manufactured gas. This gas often deposited gums and other materials on those parts of the meter which came in contact with the flowing gas. To protect as many parts as possible, the closed top tin meter was designed with an inner top which prevented the gas coming in contact with space between the inner top and the external case of the meter. Thus, the worm, the worm gear, flags, tangent mechanism, index shaft and index are not exposed to these deposits. Also, if the index glass is broken in the closed top meter, there will be no external leaks since there is no gas above the inner top.

This closed top design also permits initial proving of the meter with the outside top off using a pressure type prover. With the tangent adjustments exposed, it can be adjusted for accuracy without removing any of the parts. This design does entail the use of a pressure type packing box at the point where the crank comes through the closed top.

The closed top tin meter represents a somewhat higher initial cost and also increased repair cost because the inner top has to be removed and replaced in most repair operations.

Hard case meters (iron and aluminum) because of space limitations cannot be commercially produced with the inner closed top. Thus, to prove an open top tin meter or hard case meter by the pressure method, the cover is required on the top of the meter. If accuracy adjustments have to be made, the cover must be removed and replaced after adjustments are made, This, of course, consumes time.

The vacuum proving method was devised to permit proving of open top tin meters and hard case meters with the cover off, thus permitting fast adjustments and easy observation of the meter's action.

In theory, the vacuum method is as accurate as the pressure method; it means that the air pressure in the prover bell is just a little below atmospheric pressure in the vacuum method as compared to the pressure just above atmospheric in the pressure method.

In most proving installations, for efficiency and speed, the prover bell is moved to its zero or initial starting point by using a mechanical blower; a blower producing pressure above atmospheric for pressure provers and below atmospheric for vacuum type provers. The size of the blower equipment depends on the number of provers to be operated.

For pressure provers, small commercial blowers (*Fig. 4*) can be connected directly to the bell, with the intake air coming directly from the proving room so it will be at the proper temperature. Sometimes in larger shops because the noise of the blower is objectionable, the blower is mounted outside the proving room with the inlet to the blower, however, being piped from the inside of the proving room.

In vacuum proving, to operate one or two provers, an ordinary domestic vacuum cleaner blower, similar to *Fig. 4*, may be used. A convenient switch may be used to stop and start the blower and the vacuum connected to the prover bell pipe. Actually, in *Fig. 4*, the vacuum cleaner blower shown can be used to operate a vacuum prover, or a pressure prover by merely switching the hose connection from one end of the blower to the other.

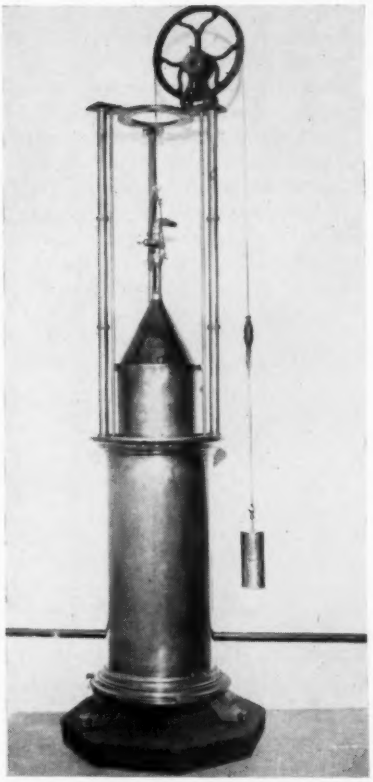


Fig. 2. Standard cubic foot bottle used to calibrate provers.

For larger installations, where a number of both pressure and vacuum provers are to be operated, installations such as *Fig. 5* can be used. Here, for noise reasons, the blower is mounted outside the proving room with ducts run inside from both blower intake and output. Thus, proving room air is taken directly into the vacuum inlet duct and this duct can be connected directly to the bell of vacuum prover. By manipulating a valve between the duct and the prover bell, the bell can be lowered to its zero point.

The duct from the blower outlet is at a pressure above atmosphere and can be directly connected in through a valve to the inlet of pressure provers and thus the bell may be raised to its zero position. Thus, vacuum provers and pressure provers can be operated directly and simultaneously from the same blower. Here the blower is rated at 100 cu ft per minute with an outlet pressure of 20 oz and an inlet pressure of 8 in. of water vacuum. It is operated by a 1.5-hp motor; 4-in. vent lines are used.

Since the use of air on both the pressure and vacuum side is intermittent, there must be an automatic valve in both the inlet line (vacuum) and the outlet line (pressure). This can be a simple weight-operated swinging check valve. On the vacuum side, it swings open to admit atmospheric air, if none of the prover bells are being lowered. When a prover bell is connected to be lowered, the volume at the swinging valve decreases and the valve tends to close, taking in less air.

On the pressure side, there is also a swinging

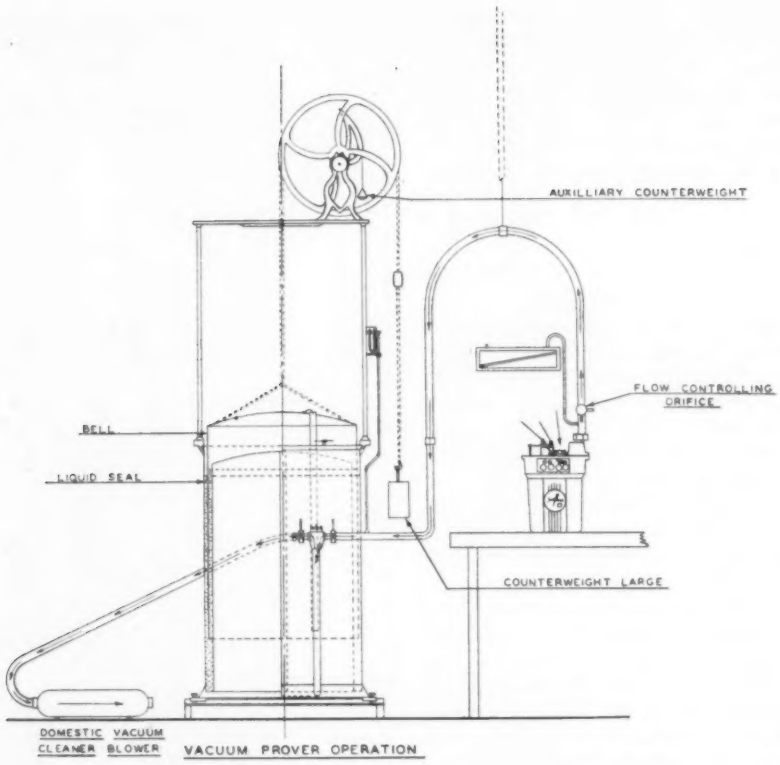


Fig. 3. Schematic showing movement of counterweight.

check valve, weight-operated. With no prover bells being raised, the check valve is wide open. When a prover bell is being raised, the check valve tends to close slightly.

At this point, it might be well to review the relationship of pressure in a gas meter to its volume, during the proving operation. This relationship is based on Boyles Law, which states that with the temperature remaining constant, the volume of a given weight of gas is inversely proportional to its absolute pressure. If we examine the *pressure* proving method, the air starts from the prover bell at 1.5 in. wc above atmosphere. It expands slightly due to the pressure drop through the hose and connections into the meter measuring chambers where there is a further pressure drop due to the flow through the various passages in the meter. There is also a pressure drop due to the friction of the moving parts, including the index. A pressure difference across the moving diaphragm pan provides the driving force to overcome the mechanical friction. There is also further pressure loss in the outlet connections and the flow limiting orifices at the meter's outlet. The pressure in the meter varies somewhat in the various compartments and fluctuates as the meter rotates. Let us assume that the meter is provided with an outlet orifice which limits the flow to the rated capacity of the meter. Then, the pressure loss across the meter is .5 in. of water column. Considering the loss in the prover connections and in the hose, the average pressure in the meter compartments will be about 1 in. of water, that is .5 in. below the bell pressure.

There is a considerable pressure loss at the outlet in going through the flow-limiting orifices to the atmosphere. Since, there has been a slight expansion of air in going from the bell to the meter, the volume increase due to this expansion may be computed as follows:

$$\text{Atmospheric pressure} = \frac{14.73 \text{ psi}}{} = 14.73 \times 27.68 = 407.72 \text{ in. of water}$$

$$\text{Absolute pressure in bell} = 407.72 + 1.5 = 409.22 \text{ in. of water}$$

$$\text{Absolute pressure in meter} = 407.72 + 1.0 = 408.72 \text{ in. of water}$$

$$\text{Expansion of 1 cu ft} = 1 \times \frac{409.22}{408.72} = 1.00122$$

This means that the change in volume has been .10 of 1 per cent, which for commercial proving can be neglected.

Now if we change the orifice at the outlet to limit the flow to the check rate, i.e., 20 per cent of the capacity rate, this means a somewhat smaller pressure loss in the proving connections and hose and so that the pressure in the meter is about 1.25 in. of water. Under these conditions, a larger part of the pressure loss is at the outlet orifice.

Absolute pressure in bell =

$$407.72 + 1.5 = 409.22\text{-in. of water}$$

Absolute pressure in meter =

$$407.72 + 1.25 = 408.97\text{-in. of water}$$

Expansion of 1 cu ft from bell =

$$1 \times \frac{409.22}{408.97} = 1.00061$$

Here, also, the percentage increase of volume .06 of 1 per cent is negligible.

Now, turning to *vacuum* proving, air from the surrounding atmosphere passes directly through the meter valves into the various metering compartments, then, through the prover hose and flow rate control valve into the prover bell. It is at this point where we find an essential difference between vacuum proving and pressure proving. In vacuum proving, the control of the meter flow rate is necessarily a valve or orifice interposed between the meter and prover bell. Thus, we cause greater differences in pressure between the meter and bell than occur in pressure proving. In pressure proving, the flow limiting restriction is after the meter, not between the prover and meter.

In using the vacuum prover to prove the meter at its capacity flow rate, we use a relatively large orifice in the hose line. When we run a check flow or low flow rate, we use a smaller orifice in the flow line which, of course, causes a relatively larger pressure drop in going from the meter to the proving bell.

At the capacity flow rate of the meter, the pressure loss is .5 in. of water, so average pressure in the meter will be about .25 in. of water below atmospheric. The pressure in the prover bell is 1.5 in. of water below atmospheric; the difference being caused by the orifice in the hose line. Then, we can compute the expansion as follows:

Absolute pressure in bell =

$$407.72 - 1.5 = 406.22$$

Absolute pressure in meter =

$$407.72 - .25 = 407.47$$

Expansion of 1 cu ft into bell =

$$\frac{407.47}{406.22} = 1.00307$$

Now we see that the expansion of gas going from the meter to the prover is roughly .3 of 1 per cent.

When the check flow orifice is interposed between the meter and the prover, there is a much slower

Fig. 4. For pressure provers, small commercial blower can be connected directly to the bell. Air intake comes directly from proving room.

TABLE I. VARIANCES IN PROVING BY PRESSURE AND VACUUM METHODS

Flow Rate	Gauge Pressure In Bell	Absolute Pressure In Bell	Ave. Gauge Pressure In Meter	Ave. Absolute Pressure In Meter	Change In Volume	If Proof Registers Correct, Meter Is
	In. of Water	In. of Water	In. of Water	In. of Water		
PRESSURE PROVING						
Open	+1.5	409.22	+1	408.72	1.00122	.122% slow
Check	+1.5	409.22	+1.25	408.97	1.00061	.061% slow
VACUUM PROVING						
Open	−1.5	406.22	− .25	407.47	1.00307	.307% fast
Check	−1.5	406.22	− .05	407.67	1.00357	.357% fast

flow rate and the average pressure in the meter would be about 0.05 in. of water, the computation will now be:

Absolute pressure in bell =

$$407.72 - 1.5 = 406.22\text{-in. of water}$$

Absolute pressure in meter =

$$407.72 - .05 = 407.67\text{-in. of water}$$

Expansion of 1 cu ft =

$$1 \times \frac{407.67}{406.22} = 1.00357$$

Here we have slightly more than .3 of 1 per cent expansion.

Table 1 gives the variances in proving by the pressure and vacuum methods at open and check flows, this variance, of course, being caused by the expansion of the air during the proving operation.

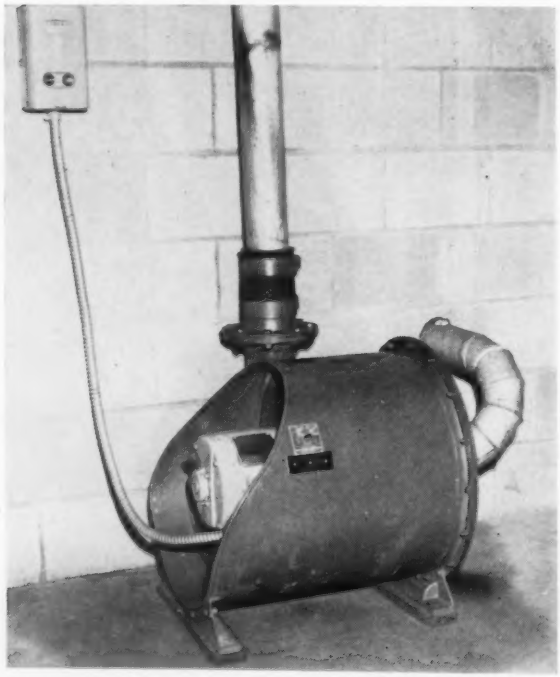


Fig. 5. In large installations, blower can be mounted outside proving room with ducts running inside from both blower intake and output.

It will be seen from *Table 1* that in using vacuum provers, if the meter is accurate, 1 cu ft through the meter will register on the prover scale due to this expansion, 1.00307 at the capacity flow and 1.00357 at the check flow. A practical way to deal with this variance is to make a separate scale for the prover mounted on one side of the standard scale, this new scale extending beyond the standard scale by about .3 per cent. Thus, the vacuum proving method can be used with a high degree of accuracy if the above discussed expansion is taken into account.

As pointed out above, the chief advantage in using the vacuum proving method in open top tin meters and hard case meters is that the adjustments for accuracy can be made without the necessity of removing and replacing the cover between adjustments. In the manufacturing process, the usual practice is to initially test and adjust the meters by the vacuum method. Then after assembling the top and putting on the badges and seals, and conducting leakage tests, the final proving of the completely assembled meter is done on a pressure type prover.

The proving operation, whether pressure or vacuum type is a highly precise undertaking. As discussed above, slight differences in absolute pressure must be recognized and accounted for. The temperature of all parts—prover, meter, and air—should remain constant during this operation; thus, air conditioned proving rooms are an advantage in that they do not permit changes in temperature in these parts, providing the meters are left in the proving room at least 12 hours before proving.

At 70°F temperature, 1° increase in temperature will cause approximately .20 of 1 per cent expansion of the air. Thus, if air in passing from the prover into the meter is colder by 3°, the air contracts .6 of 1 per cent. If the meter registers okay in proving, it really is .6 of 1 per cent fast.

Humidity may play a part, but not as an important one as temperature. Some leather diaphragms react to humidity changes and may slightly influence the proof. Also, evaporation of the sealing liquid from the prover bell may affect temperature in the bell. However, by using a sealing oil in the prover which has a low evaporation rate, this effect can be for all practical purposes eliminated. Good meter proving, which is essential to the successful operation of a gas utility, should be a prime requisite of utility managements. This means providing good equipment and observing the factors discussed here. ■

Everyone agrees that safety programs are necessary and good. But how much emphasis should be placed on them? What about the quality and noture of such emphasis? What will result? Here are some ideas.

What management expects of a safety program

By ALAN R. BAILEY
Senior Vice President
Southern Counties Gas Co.
Los Angeles

TO discuss "What Management Expects of a Safety Program" is not what I would call a safe undertaking in itself. The words imply that all management people and management groups are of one opinion on the subject. And this certainly is not the case. If it were, all safety programs — or at least the basic precepts of all safety programs — would be alike. Rather than this we have quite broad differences among companies in the scope, pattern, and intensity of safety programs.

The thoughts that I express here as being "what management expects" are largely my own views on the matter, based on some years of experience in the utility business. I believe that the members of management in my own company are in full accord.

Surely no one in a management position anywhere will argue seriously that a safety program is not good. Of course safety is good, and attention to safe working practices in industry is necessary. By the same token, we can also say that to have food on the table is good, and necessary. But there is a great deal of poor food in this world and some of it is not worth the price we pay. The comparison can be carried further by pointing out that generally much more food is eaten than is either healthy or necessary. It is not a matter of safety's being good or necessary, but rather a matter of how much emphasis we place on it, the nature and quality of that emphasis, and the impact of any steps we take.

Many words have been spoken on the subject of safety, both inside and outside the industrial scene. Many dollars have been spent, too. Certainly the objective in expending all these words and all these dollars has been one on which there is universal agreement -- to preserve life, limb, and property. But somehow most human activity is ultimately reduced to a practical question—are the results commensurate with the effort? No safety program yet has presumed to guarantee that it will end all accidents. After every safety rule has been written and every safeguard has been taken, there is still hazard in the mere act of living, and accidents still occur.

Some very real problems are presented to the company executive in all this. How much should the company budget for a safety program? Will a safety program actually decrease lost time and injuries? How do you measure the value of a safety program? If it does not entirely pay its way, how much of an outlay is justified? How should the money be spent? The answers to these questions must somehow be found in the concept that guides the executive in the over-all administration of his business—deliver the most possible at the least practicable cost.

As a general statement I believe it can be said that management expects, when approving a safety program, that by so doing it will achieve a decrease in the company's existing frequency rate of accidents, and lessen the severity rate. And management expects that such improvement will be realized at a reasonable program cost.

Within this general framework there are some specific points on which I should like to enlarge.

First let me talk about costs. Management certainly wants an adequate safety program, and in most cases a centrally coordinated one, but there is no reason why such a program must interfere with reasonable productivity. No

"No safety program yet has presumed to guarantee that it will end all accidents."

intelligent person would propose short-cuts which would introduce hazards, and this is most certainly not what I have in mind. What I do advocate is a careful scrutiny of the cost and effectiveness of the practices which are purported to improve the results of a safety program. For example, there is the item of safety committee activities. For some reason unknown to me, many companies starting a safety program immediately establish a so-called "safety committee" which then proceeds to hold monthly meetings. I seriously question the real value of an elaborate "safety committee" program. Some well-planned meetings for education and group information undoubtedly serve a useful purpose, but holding regular meetings for "meetings sake" alone are seldom worth the cost. I subscribe to the principle that "One decisive mind is usually worth a dozen men thinking aloud." In any event committee meetings should be objectively examined from time to time and appraised as to their value. Unless there is careful programming and effective leadership, safety meetings can drift into a stale and sterile routine. Or they may become rambling "yakfests" that arrive at no conclusions and succeed only in increasing the costs by the amount of time they take—in fact they can defeat their very purpose by absenting supervisors from their regular jobs. Even the meetings which "seem" to be successful by the fact that they stimulate considerable interest and response from the group, should be examined objectively from the standpoint of actual effect upon the job. In the final analysis there must be some sane relationship between the time spent talking about accidents and their prevention, and the man-hours required to actually perform the job. To make my point in a ridiculous way, we might say that if our *only* objective is to prevent accidents, this could be achieved by sitting around talking about the job and never doing it. Obviously such a solution is not practicable, as the real objective is to get the work done.

So-called "tailgate" conferences should also be sampled for effectiveness. It is my opinion that tailgate "huddles" of the foreman and his crew at the start of a job provide an excellent means for putting things in order and prescribing a safe approach to the task at hand. They make for coordination in assignment of duties, and provide an opportunity to set the pattern for safe conduct of the job. However, the foreman must run these as "team huddles," acting as the captain who calls the plays—he must maintain his position as the one who explains what should be done and how it is to be done. While a reasonable amount of two-way conversation is good, the foreman should not permit his tailgate session to deteriorate into a debate as to who is to do what. If a safety program is to be a concerted, controlled company effort, the supervisor must retain authority and responsibility at the job-site. He must make safe working habits a part of each job, as much so as knowledge of the correct tools to be used, the types and sizes of fittings needed, how much time a given task should reasonably take, how to make out job reports, or how to complete a time card. Safety is as basic as this. It is not a "program" superimposed on the essential requirements of getting the job done; it is part and parcel of every action that gets the job done.

A subject related to the cost of a safety program is appraisal of its value. In justifying the cost of any program, we generally turn to the record that purports to show what the program has accomplished. While there may be other considerations, statistics and the costs-versus-results represented are usually the yardstick which management uses in appraising any program.

In safety programs the statistics are usually derived from accident reports, which brings up the matter of how accidents are reported on the job and subsequently recorded. Management wants realistic and valid figures, it does not want a "paper profit" based on "sharp-pencil" practices, nor a suppressing of legitimate accident reporting. Let me give you an example of what I mean.

A company I was associated with some 30 years ago—and since this company is no longer in existence I can speak without putting anyone here on the defensive — sought to improve its accident experience by establishing a safety department. Positions were created for a safety engineer and a staff. Within a year remarkable strides had been made in reducing the recorded accident frequency and severity. But there was a "catch" to it. Undeniably some of the improvement was bona fide, but much of it resulted from differences in the manner of reporting accidents. Prior to the establishment of a safety department, all employees with injuries, including minor cuts and bruises, had been sent to a doctor for treatment, and each case had been reported as an accident. With the inauguration of the safety department, however, a first aid room was set up as a part of the department, and simple injuries were treated there. If no loss of time was involved, cases treated by first aid were not reported as accidents. The effect on the accident frequency rate was a startling improvement. The severity rate also showed considerable improvement due to a reduction in

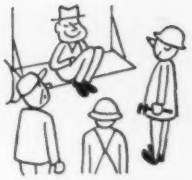
"Unless there is careful programming and effective leadership, safety meetings can drift into a stale and sterile routine. Or they may become rambling 'yakfests' that arrive at no conclusions and succeed only in increasing the costs by the amount of time they take . . ."

lost time reported. This was achieved largely by insistence on prematurely returning an injured employee to the job. Such pressure often resulted in the man's returning to work before he was physically able to fully perform his duties, and even to the extent of his being totally idle on the job.

Of course such practices conceal rather than clarify the true accident picture. This is not acceptable to a management interested in the actual facts about its safety program. An improved record is desirable, to be sure, but it must be realistic and not at the expense of denying necessary medical help or concealing the true extent of injuries. Let me say again that management wants an actual reduction in injuries, not a "paper profit."

Next I should like to touch upon the working relationship of the safety department staff with line supervision. This relationship may vary from company to company depending upon organizational pattern and physical circumstances, and upon the preferences of the different managements. Regardless of what the particular company pattern may be, however, I am sure that any management wants a clear-cut understanding of the assignment of authority and responsibility. My own opinion on this subject is that authority and responsibility for day-to-day safe conduct on the job must be placed solely and exclusively with line supervision. I say this for two reasons. First, safety is an integral part of each man's job, not a thing apart; and just as the line supervisor must be held responsible for work performed under him, he must also be held accountable for the job safety. Second, and this of course is closely related to the first reason, when the safety director or anyone on his staff assumes authority or responsibility for day-to-day safety supervision, he is providing line supervision with a ready-made alibi in case of an accident—"I did the job just the way the safety man told me to." Yet it is not uncommon to find safety people doing this sort of thing, dictating what is to be done in a given work situation. I strongly emphasize my own opinion that the safety department staff should not be permitted or expected to control on-the-job activities by issuing direct orders.

". . . Tailgate huddles of the foreman and his crew at the start of a job provide an excellent means for putting thing in order and prescribing a safe approach to the task at hand."



The functions of a safety department, as I see them, are to develop safer work methods, to issue general rules on safety, to investigate and recommend safety equipment and devices, to audit work performance for compliance with safety regulations, and to counsel line supervision on observed practices needing improvement or correction.

In addition, the safety staff should investigate accidents and patterns of accidents, bringing its technical skills to bear on determining causes and recommending ways of avoiding recurrence. Along these lines, I favor the procedure of holding a "critique" following any serious accident. This is the practice of calling together all those concerned for a frank and open discussion of causes, probable shortcomings in planning and conduct, and remedies. However, such critiques are successful only to the extent that they are not permitted to become "head-hunting" expeditions. In this respect, as in any other participation, the safety staff should not in fact or appearance relieve the line supervisor of his basic authority and responsibility for the job.

As a corollary to the subject of safety department functions, there is the matter of responsibilities of line supervision. Management most definitely expects line supervision to fully and willingly assume its responsibilities in carrying out the safety program. If safety regulations have been wisely prescribed and are practicable, then they must not be emasculated by supervisors condoning infractions.

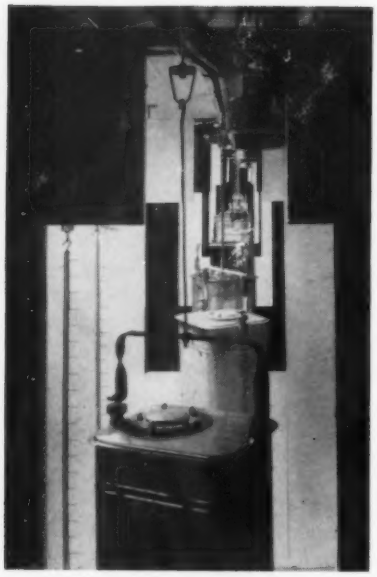
While it may be easy for a foreman to "look the other way" when an infraction has taken place—particularly where no harm has been done—this can lead to employees believing that the rule wasn't necessary, and that perhaps other regulations are "just for the record" and not really important to the job. A supervisor must have the courage, and sufficient concern for the employee's safety, to take proper action when an infraction is observed. Of course I mean *proper* action—a word of advice, a reminder, or a private reprimand; not ridicule or public censure. Line supervision should be equally vocal about requesting changes in safety regulations which are outdated or not practical. They should be the first to direct attention to a piece of safety equipment which is so cumbersome that it is not practicable, or a standard practice so unrealistic that even foremen or superintendents have no enthusiasm for it.

Closely related is the necessity for front-line supervision to accept responsibility for training the new employee in safe working habits. Certainly the first few weeks on the job are the most formative, and it is essential that the supervisor have the ability, willingness, and patience to do an adequate job of training. The safety department and training staff can do much to assist the supervisor in his presentation and to augment his training, but in the final analysis the line supervisor must instill in the new employee whatever lasting tenets of safety he is to acquire.

(*Continued on page* 82)

"When the safety director or anyone on his staff assumes authority or responsibility for day-to-day safety supervision, he is providing line supervision with a ready-made alibi in case of an accident."

Automatic line speeds painting, results in more efficient job



Meters are transported through paint booths by overhead conveyor.

By DON WRIGHT
Managing Editor

MANY meter shops are using, or considering, automatic equipment to make the painting operation more efficient. The completely automatic painting system at American Meter Co.'s new Fullerton (Calif.) plant has drawn the interest of many meter shop superintendents.

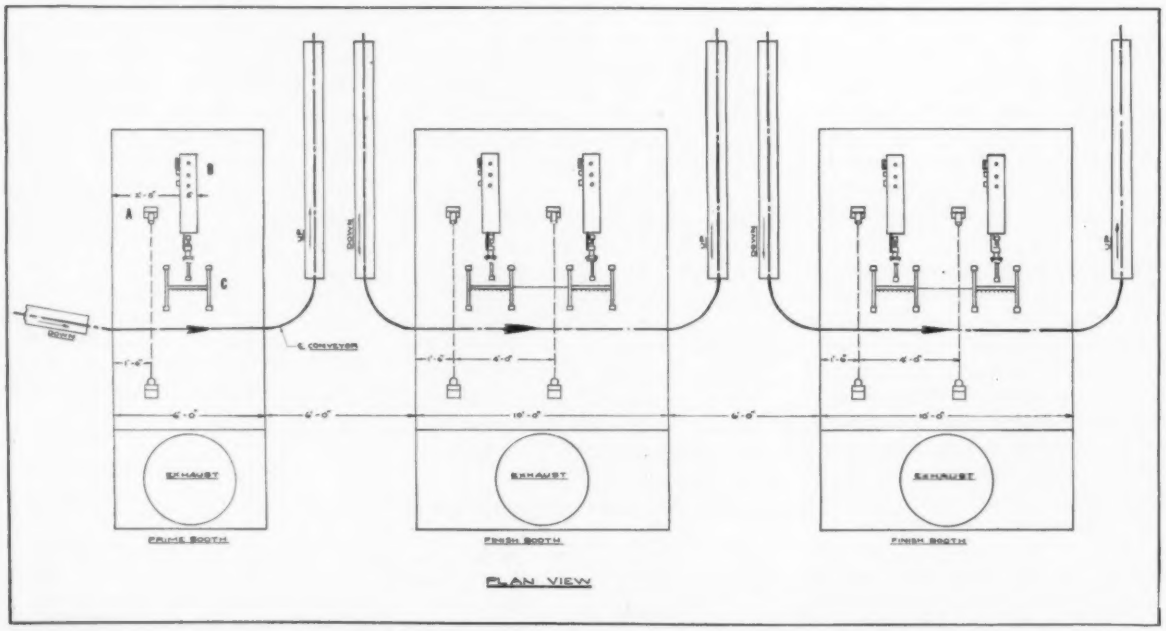
This line can paint a total of 800 domestic meters per 8-hour working day by the electrostatic process. The electrostatic process materially reduces paint wastage —the system employed at Fullerton is about 30 per cent more efficient than hand spray for the products currently manufactured. About 50 per cent of the paint is usually wasted in manual methods. Of significance also is the more uniform finish thickness possible and the savings in application labor.

Meters are placed on a 570-ft overhead conveyor by workmen. This is the last time they are touched until they are taken off the conveyor approximately 2.5 hours later, completely painted and dried.

A new meter is placed on the conveyor immediately after it is proved. The conveyor first runs through a vapor - spray - vapor Detrex degreaser, where nearly all surface soils are removed.

Then the meter enters the prime coat booth, where it receives the first of three coats of paint. American Meter has three Ashdee automatic electrostatic paint booths on its line; one for primer, two for finish coat.

Spray guns in the paint booth are controlled by photoelectric



Schematic drawing of automatic paint line. In booth at left, A is the photo-electric timing unit, B the bank of paint guns, and C the actual area of painting.

timers. Twenty-four seconds after the meter has crossed through the beam, the spray guns are activated. Paint is sprayed for 14 seconds, by four guns. As they pass through the paint booths, the meters are rotated slowly on the conveyor. Each surface of the meter receives an equal amount of paint.

Paint is applied to the meters through the electrostatic process. This process consists of the creation of a difference in electrical potential between the atomized particles of coating material and the surface of the product to be finished. This is accomplished by ionizing the paint particles.

In the Ashdee booth, paint particles are ionized externally by electrodes placed between the spray guns and the meters on the conveyor. The electrode ionizing current is about 2 milliamperes when the negative electrode voltage to ground is about 100,000 volts. The meters, being grounded to the conveyor, are positively charged.

Paint is atomized through the spray gun at 12 psi. This low pressure atomizing causes the paint particles to practically float in the air; thus, the negative particles are attracted to the grounded meter.

A water trap at the back of each booth collects any paint particles that blow by.

Each of the four Binks spray guns in the booth is aimed at a specific area on the meter. They are adjusted for minimum pattern overlap.

When the meter leaves the primer booth, it is suspended on the conveyor for 35 minutes to dry. Then it enters the first of the two finish booths. Here it receives the first finish coat—from two separate batteries of spray guns, each actuated and controlled by a photoelectric timer. Then, the meter is suspended again for another 35 minutes to dry.

The final finish coat is applied in the same manner in another twin-battery booth. After the meter has received its second finish coat, it is dried on the overhead conveyor for 45 minutes. Then it is removed from the conveyor by a workman, who installs the index.

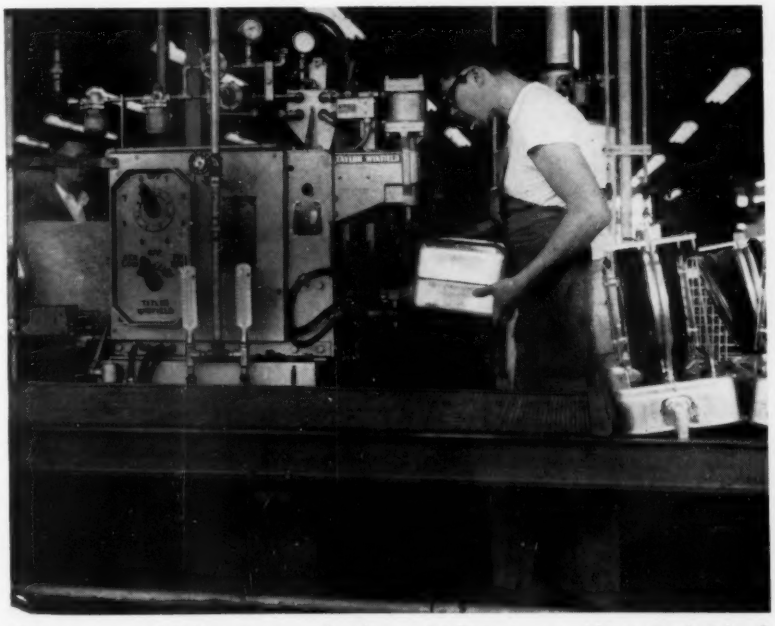
Meters are painted in two booths such as this, and in one single unit booth. Paint is applied by electrostatic process.

The meter is then stacked to await shipment.

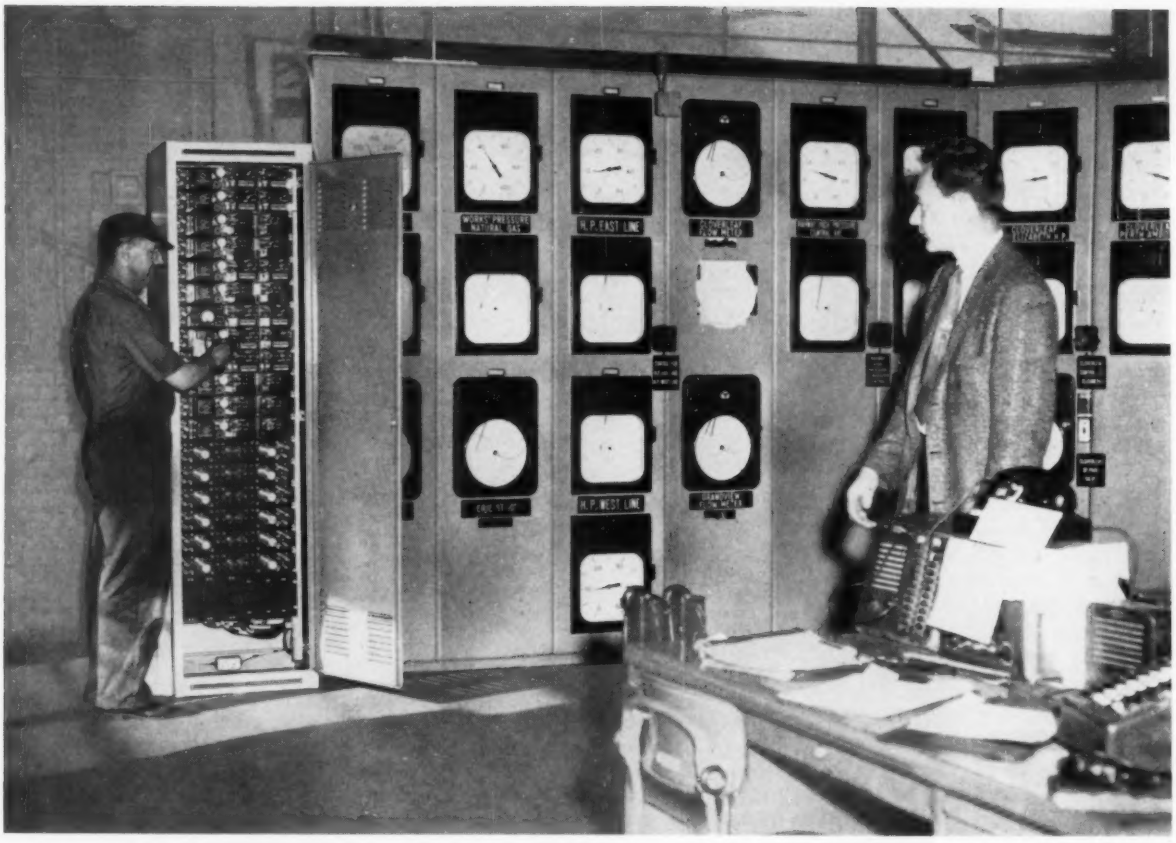
Because of the warm climate that is prevalent all year in southern California, it has not been necessary to install an oven to dry the freshly painted meters. This has saved American Meter time and money.

Spray guns in the paint line have been set to apply a total paint thickness of 3 mills—over twice the average film thickness of normal single coat systems.

The primer and finish coatings were carefully selected for extreme weatherability. The finish coat is a vinyl based enamel pigmented to the American Standards Association No. 49 Gray. ■



Meters are proved before they are placed on paint line conveyor. This is the last hand operation; all painting is done automatically.



A remote station in the Elizabethtown system. Tone control equipment is maintained in the field by company personnel.

Audio tone control in gas distribution systems

By **L. C. MENKES,** Hammarlund Manufacturing Co., New York

DURING the past few years there has been a rapidly growing trend toward centralized operations in the gas distribution field. The controlling and monitoring of remote stations in gas systems has been a great help in meeting systems expansions, in increasing efficiency of operation and in combating rising operational costs.

There are several types of remote supervisory systems available to the gas industry. One of the most flexible and economical systems is based on the use of audio tone frequencies which convey the controlling information over ordinary telephone wires, VHF or microwave. Inasmuch as the writer is familiar with equipment of this type manufactured by the Hammarlund Mfg. Co. Inc., references will be made in accordance with applications experienced with that company's equipment. Most of the definitive information is applicable to audio tone equipment of almost all manufacturers. There are many versions and modifications of audio tone equipment available, but the most widely used is the comparatively simple, dependable on/off type which will be covered in this article.

The transmission medium employed in an audio tone system, whether telephone wires, VHF or microwave, must, of course, be capable of passing audio frequencies. To attain utmost efficiency, the centralized control system should also utilize the transmission me-

dium itself to its fullest extent.

Now, what are audio frequencies? Audio frequencies are those frequencies between 15 to 20,000 cycles per second, or frequencies to which the human ear normally responds. They are actually ac voltages making a number of complete cycles every second. The number of cycles per second, abbreviated as cps, determines the frequency. The human ear depends upon the variations of these frequencies for intelligibility, whereas audio tone signalling depends upon the reception of only one pure frequency to accomplish a function.

As mentioned before, all transmission media have available the ability to carry or transmit audio frequencies. The frequency response, or passband of a transmission medium refers to the range of audio frequencies that can be "heard." The most common frequency or passband availabe for transmission is from 300 to 3000 cps. This passband is normally available on most telephone wires and VHF or microwave. Another important factor in the transmission of audio tones is the attenuation of the media—in other words the reduction or loss in the strength of the signal. The audio tone frequency, an ac voltage nominally held to one volt or less, when transmitted from one point to another experiences a reduction in the strength or amplitude of the signal. This change is referred to as attenuation and is defined in terms of decibels (db). A decibel is the standard unit of comparison between two quantities of electric power. Circuits provided for audio tone transmission systems should not have more than 20 db loss at any operating frequencies within the passband.

Since each frequency is a pure tone, it is possible to transmit many of them simultaneously and independently of each other in two directions over a single medium. The ability to transmit so many frequencies, which of course is limited by the passband of the transmission medium, provides the versatility and flexibility which have accounted for the growing application of audio tone signalling. Frequency multiplexing, or channel derivation, refers to the transmission of many audio frequencies on a single medium. The audio tones are fixed tuned at the transmitters and receivers and are nominally spaced 100 cycles apart *(Table 1)*.

A typical audio tone transmitter consists of an oscillator, which is a circuit using a vacuum tube capable of converting direct current into alternating current of a finite frequency determined by inductive (L) and capacitor (C) constants. The LC constants are built into a frequency determining element which is fixed tuned and sealed, thus providing stable frequency generation. The LC circuit is referred to as a "tank" and differs for each transmitter frequency. It is factory tuned to within one cycle of the designated frequency and can undergo extensive temperature ranges without appreciable change. A vacuum tube is employed as an oscillator, while a second tube provides the amplification of the output necessary to transmit the signal over the carrier medium. Since only the tank circuit differs for each frequency, it is possible to make all audio tone generators, which consist of oscillator and amplifier tubes, identical for all frequencies and provide them in a plug-in type package. (See *Fig. 1*). There is only a single adjustment for each audio tone frequency, that being a potentiometer screwdriver adjustment controlling the output of the signal. This is similar to the volume control of a radio or television receiver.

Now that the tone has been generated and amplified for introduction to the carrier medium, the means of recognizing or "hearing" the various frequencies at the other end of the carried medium will be explained.

At the receiving end, the first item encountered by the various frequencies traveling on the carrier medium is a filter. The filter, or bandpass, is made up of an assembly of fixed tuned circuits designed to pass frequencies within a definite band with nearly equal response and to reduce or reject frequencies outside the specific band. Just as in the case of all tone transmitters, the bandpass filter differs for each frequency. The filters are fixed tuned and sealed in a compound eliminating variations due to temperature changes. The output of the bandpass filter is amplified and rectified into a dc current which is used to operate a vacuum tube called a keyer tube. Within the circuit of the keyer tube is a relay which is sensitive to a change in current. When an audio signal of the proper frequency is received by the tone receiver, it is filtered, amplified and rectified. The resultant increase in current which is associated with the "signal present" condition, results in the operation of a relay transferring it from a normally inoperative state to an operative condition. The relay may be a

TABLE I. STANDARD FREQUENCIES USED IN AUDIO-TONE UNITS.

Band A (6 Freq.)	Band C (16 Freq.)	Band D (17 Freq.)
465	2000	3625
565	2100	3775
665	2200	3925
765	2300	4075
865	2400	4225
965	2500	4375
	2600	4525
Band B (9 Freq.)	2700	4675
1075	2800	4825
1175	2900	4975
1275	3000	5125
1375	3100	5275
1475	3200	5425
1575	3300	5575
1675	3400	5725
1775	3500	5875
1875		6025

Wideband filters centered at every other standard frequency can be furnished for high-speed keying.

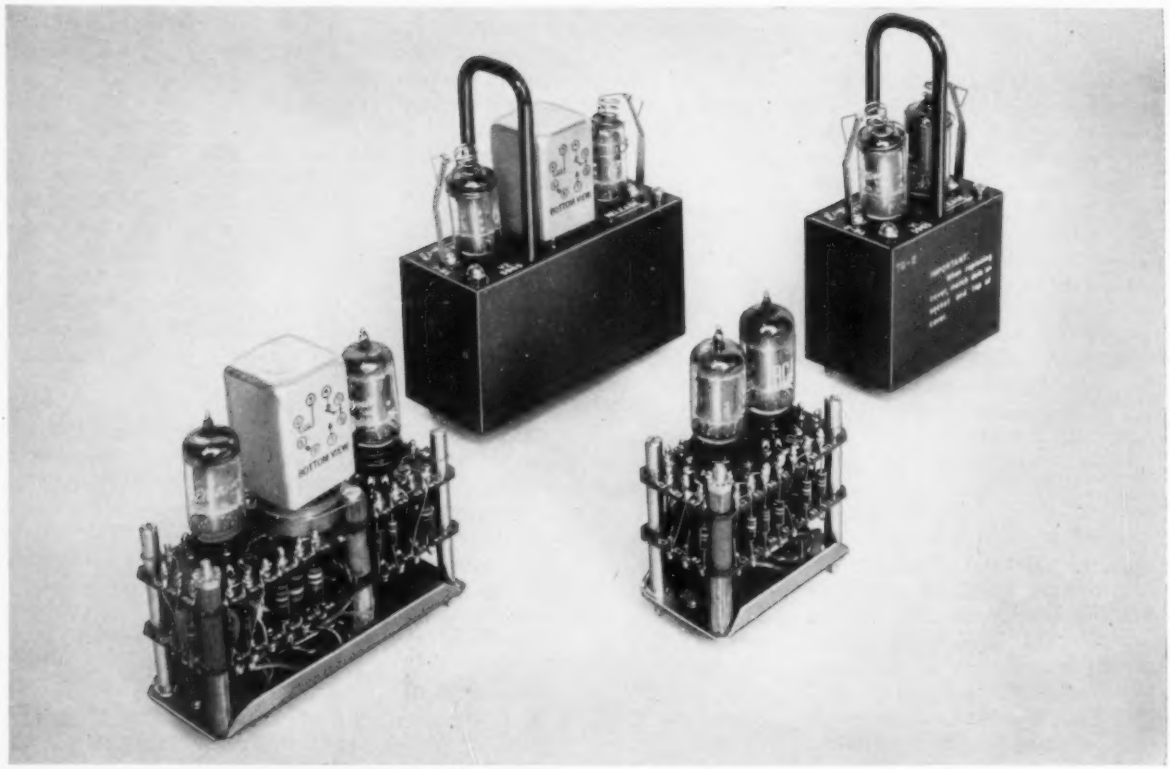


Fig. 1. At left is the tone receiver, at right, the tone generator.

single pole, double throw relay with an arm, a normally closed contact, or a normally open contact. Relays are of the plug-in type. As in the transmitter unit, the only item that differs with each frequency is the audio tone bandpass filter. The tone receiver unit itself consists of the amplifier tubes, the rectifier circuit, keyer tube and relay. This unit is of the plug-in type (see *Fig. 1*).

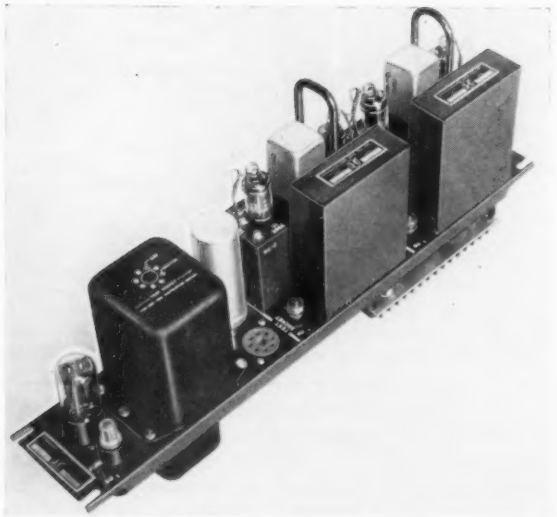
There are five types of units available. Each is entirely self-contained with its own power supply *(Fig. 2)*. All units are mounted on a 3½-in. x 19-in. chassis for standard RETMA racks. The packaged, standard unit choice offered permits the user additional flexibility and economies as only the required frequencies for immediate needs are initially installed. As the need for expansion of the system arises, additional frequencies (functions) may be added by simply paralleling the power supplies and transmission medium circuits.

The operation of a single audio tone channel functions on the basis of turning the tone "on," receiving the signal and recognizing the "signal present" condition, vs. the "no-signal" condition. The plug-in relay, an integral part of the tone receiver, can then be used to actuate any on/off type of circuit. Various functions of control can be performed on a fail-safe basis. With the tone present, the relay operational control function would be performed. Without the signal, the relay will drop out. It can be readily seen that loss of the transmission medium or power at either the central location or remote station would provide a fail-safe operation (see *Fig. 3*). The preceding operation of *tone on, function on* could very well be applied to a pump, motor, or control operation in any industrial field.

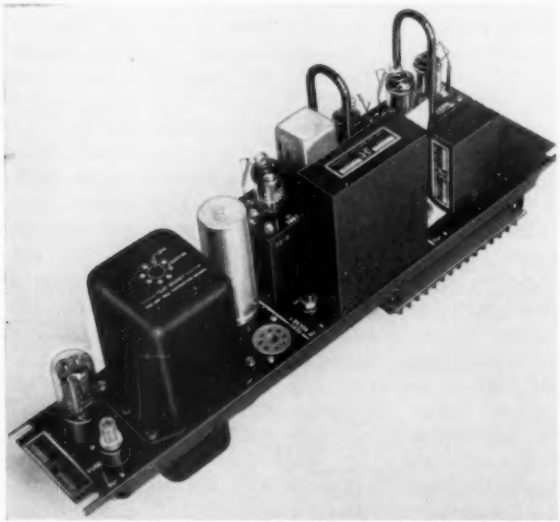
If two functions are to be controlled, a dual transmitter and dual receiver unit would be used (Fig. 3). The contact closures provided by the plug-in relay are brought to the terminal board on the rear of the tone receiver unit. Paralleling connections to existing controllers and operators are made from this point. If more than two functions are required, additional frequencies in multiples of one or two would be added. In all cases, local remote switches would be furnished to permit local operation and maintenance without interference from the central station. The contacts of the relay are rated at 2 amps, 115 v, non-inductive. Larger contact ratings would necessitate an interposing relay. The plug-in relay would then be used to operate the interposing relay whose contacts in turn would perform the desired operation.

In many cases it is desirable to supervise the controlled operation by means of a light or metered indication. The most simple operation would be controlling a function and then supervising it by means of a light utilizing a pair of duplex units, or two separate frequencies (Fig. 4). Each duplex signalling unit consists of a tone transmitter and receiver, along with a power supply on a 3½-in. x 19-in. chassis. The transmitter at the central location on one frequency would be used to operate a matching tone receiver at a remote station, providing the control function. A second frequency, whose transmitter would be located at the remote

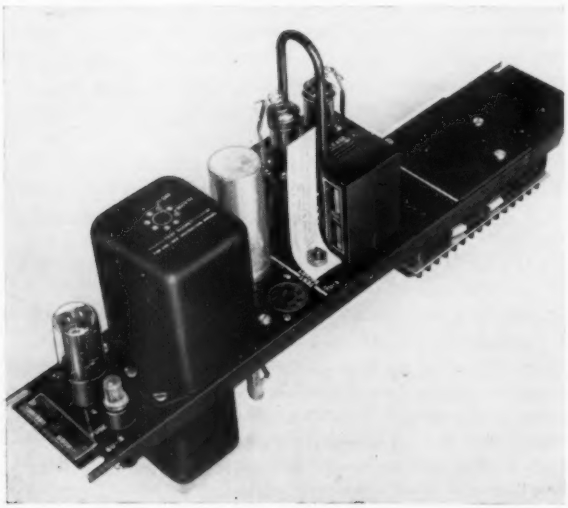
Fig. 2. Different types of tone control equipment.



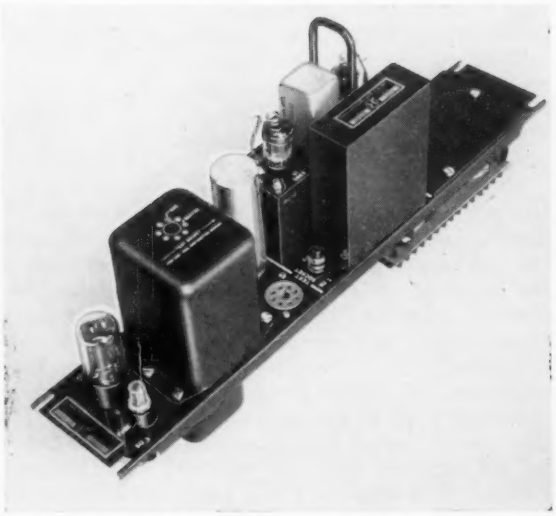
Dual receiver unit. Two audio-tone receivers with power supply.



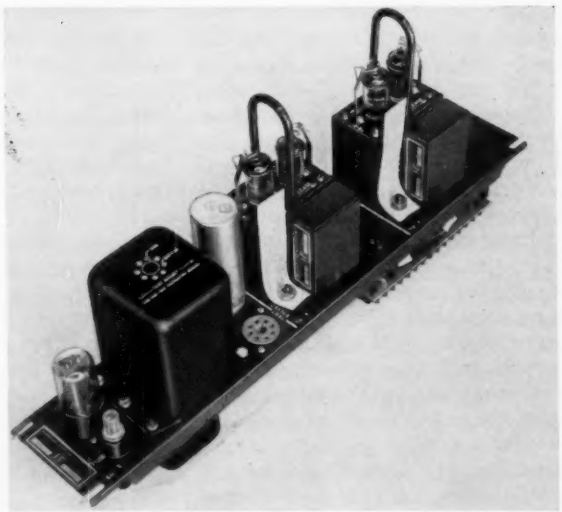
Duplex signalling unit. Audio-tone transmitter and receiver with power supply.



Single tone unit. Audio-tone transmitter with power supply.



Single receiver unit. Audio-tone receiver with power supply.



Dual transmitter unit. Two audio-tone transmitters with power supply.

point, would be operated by a pair of supervisory contacts on the controlled function. A change in status at the remote location would then affect the supervisory contacts. With the control function on, the supervisory contacts would close, thereby keying, or turning on the tone transmitter at the remote location. The receiver on the duplex unit at the central location would receive the second frequency. Its output relay would be used to turn a light on or off, providing supervision.

In most applications, the operation of a control function results in a change of a measured variable at the remote location. The change of the measured variable can be telemetered from the remote station to the central location and is used as a means of supervising a control operation. The telemetering most commonly used is the pulse-duration type. A telemetering transmitter performs the necessary transducing from a pressure, a flow, etc., into a linear-timed output which is actually a contact closure. The contact closure is linear and proportionate with respect to the measured variable. Various sampling rates are used varying anywhere from two seconds to 15 seconds. Most of the impulse duration telemetering depends on the transmission of the dc or ac pulse, which is controlled in length by the contact closure of the telemetering transmitter. It can be readily seen that audio tone frequencies can be applied for impulse duration telemetering since it, too, is an *on/off* type operation. Using audio tone pulses, it is then possible to transmit many channels of telemetering simultaneously by utilizing various frequencies over a single carrier medium. The audio tone receiver's relay will perform the desired operation of the telemetering receiver positioning it in accordance with the transmitted variable.

Instead of using a light as a means of monitoring a control operation, it would then be possible to furnish a telemetering transmitter and receiver which would provide the operator at a central location with the means of monitoring his control operations by actually watching the change of measured variables at the remote location (Fig. 4).

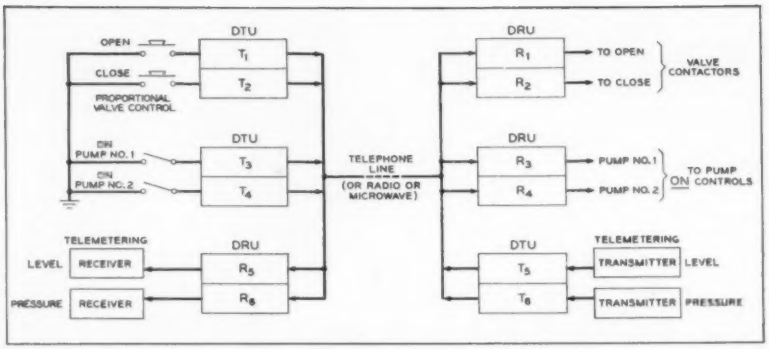


Fig. 3. Typical remote control and telemetering system for a waterworks installation.

Another type of control commonly required is the throttling of proportional control of a valve or regulator. In this case two frequencies are used to perform the desired operations. One is referred to as an *open* or *raise* frequency and the other as a *close* or *lower* frequency (Fig. 3). A lever switch or push-buttons can be utilized which, when operated, will result in the keying of either the *open* or *closed* frequency, performing the desired function. Reception of the tone at the remote location will, through the use of relay contacts in parallel with the controller contacts, result in the function being performed. The operation will continue as long as the actuating control at the central station is operated. Release of the switch on push-buttons at the central station will result in the tone dropping out, the matching tone receiver's relay dropping out, and the function remaining at the last called-for position. The operation, of course, can be reversed using the second frequency, this achieving proportional, nudging, or throttling control.

With the specific applications outlined, it is possible to put together a system consisting of remotely controlling *on/off* functions, a throttling operation, and telemetering from a remote location. Inasmuch as only six of the approximately 25 frequencies have been used it can be seen that such a system can be expanded at any time by the simple expedient of adding new frequencies. The total space required for such a system would be 10½-in. x 19-in. at each location.

Up to this point we have discussed the operations between a centarl and a remote station. The various industrial organizations, utilities and other systems may require many stations to be remotely controlled and supervised. In such systems it is quite possible to combine several of the remote stations with a common transmission circuit terminating at the central station, thereby minimizing the transmission circuits necessary for operations.

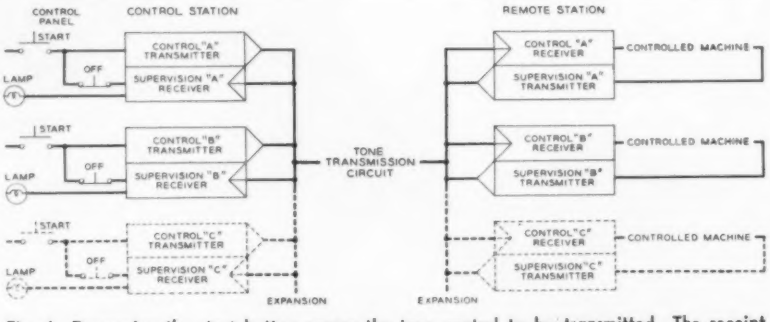


Fig. 4. Depressing the start button causes the tone control to be transmitted. The receipt of this tone at the remote station operates the machine, and absence of the tone stops the controlled machine. Operation of the controlled machine causes a supervision tone to be transmitted back to the control point where it operates a supervision lamp. Receipt of the supervision tone also closes the start tone keying circuit, maintaining the transmission of the control tone and making the entire circuit dependent on the "closed circuit" condition.

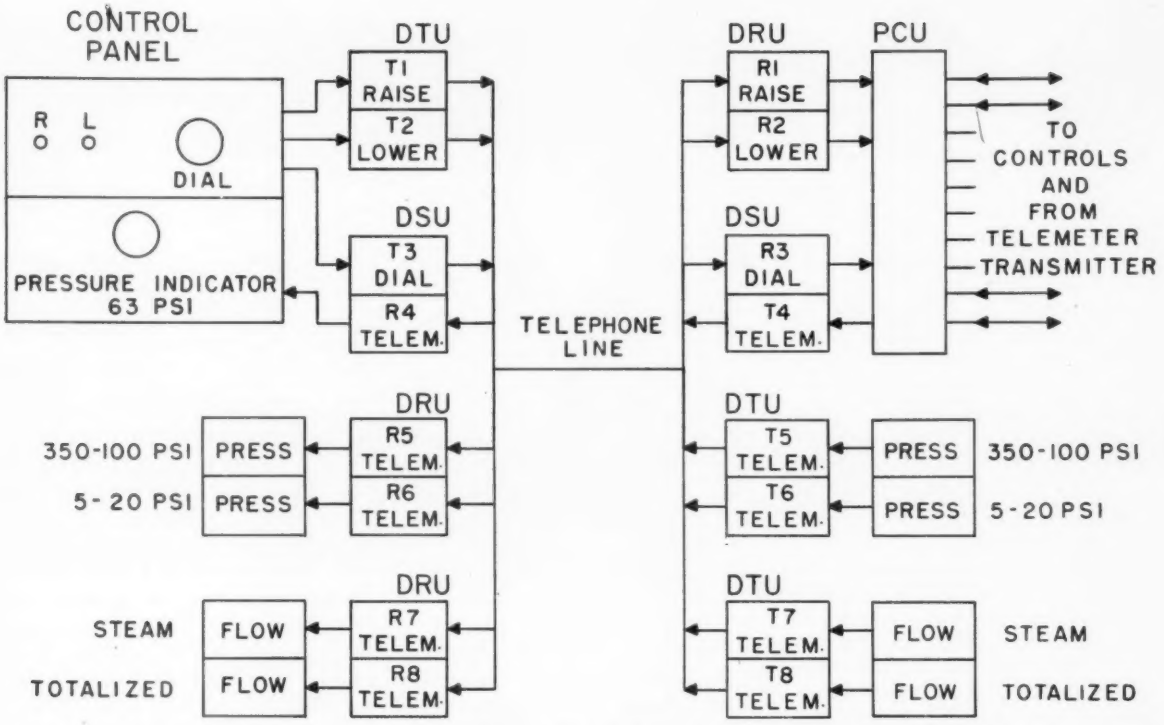


Fig. 5. Diagram shows how three frequencies can be used to provide selective control, either on/off or proportional control of 10 functions at remote location.

Since there are approximately 25 frequencies available, it is possible to operate several stations independently and simultaneously on a common transmission medium. This is highly desirable from an economic standpoint, inasmuch as total line charges are from the central location to the furthest point, instead of separate circuits from each station to the central location, which would, in essence duplicate circuits and charges.

It is interesting to note the disposition of frequencies on such an application. The attenuation of the transmitted signals varies with respect to the distance from the point of transmission to the point of reception. In an audio tone signalling system the lowest frequencies are attenuated the least and therefore are used on the longest "runs." This principle of frequency allocation according to transmitting distance permits balancing a system so that all signals at the point of reception are of approximate strength. The principle of multiplexing stations on a common transmission circuit is used to provide simple, inexpensive monitoring of substations, trap farms, or any other industrial application requiring multiple alarm supervision.

In the multiple alarm supervision system a different audio frequency is employed at each remote location. This frequency is on at all times which signifies a normal condition at the remote location. If an alarm or fault should occur, the transmitter is turned off and the relay-switch at the central stations receiver tuned to the particular frequency, drops out, notifying the dispatcher by both visual and aural means that a fault has occurred at the particular remote location. The dispatcher then will notify the maintenance group that a fault has occurred. Upon checking at the remote station, a local annunciator panel is used to pinpoint the actual fault. Such an alarm system permits a great number of locations to be monitored from a single, central point.

The fault alarm system is also fail-safe in that the loss of tone always results in an alarm. Pinpointing of faults at the remote location can be monitored separately by use of other frequencies at the remote location. In such an installation, a dual unit would be used instead of a single transmitter unit.

In many installations the required operations, supervisory functions, and telemetering channels exceed the capabilities of a transmission circuit, in that the total number of required frequencies would exceed 25. In such instances a selective type of operation for both control and telemetering can be utilized, thereby permitting multiplexing within a specific audio tone channel. A total of three frequencies can be used to provide selective control, either *on/off* or proportional control of 10 functions at a remote location (see Fig. 5). One tone channel can be used with a telephone dial, thereby providing a coded transmission of from one to 10 pulses. At a remote location, a matching tone receiver whose relay output would be used to operate a stepping-type switch could provide the necessary selection of points 1 through 10. For added security, "negative keying" can be utilized. "Negative keying" is defined as keying the tone *off* instead of *on*. The tone is kept on constantly and the coded pulses are

obtained by turning the tone *off*. For example, if the digit, or circuit 5, was required, five holes or notches would be seen by the tone receiver at the remote location. The pulsing output of the tone receiver relay would be used to operate the step switch of a pulse counting unit (PCU). This unit makes the proper selection of a circuit for the following audio tone signals. The other two frequencies, of the original three, then have a channel to travel permitting operation of a function. The operating frequencies are normally *off* and turn *on* only when a channel has been selected by the PCU unit. A fourth frequency could be added to this system which would provide selective telemetering. For example, if a gas distribution system had several meter runs requiring the operation of a valve to increase or decrease the pressure of that specific run, a telemetering transmitter of the impulse type could be employed at the pressure point desired to be monitored. The fourth tone transmitter would be automatically connected to the correct telemetering transmitter of a specific meter run upon selection of that channel. A common indicator at the central location would respond to the telemetered pulses. The control functions could then be operated at the same time while supervising the operation through the use of the telemetering indicator. Four frequencies would then be used to provide proportional or *on/off* control of 10 functions with 10 selective supervisory telemetering channels also available. Since we have used only four frequencies of the 25 available, it is possible to add many continuous supervisory indications or continuous telemetering channels throngh the use of different frequencies.

It is possible to go beyond the 10 functions through the use of selective relay systems. However, the main purpose of this discussion is to describe audio tone signalling in its simplest forms. Systems are available up to 50, 100, and 200 points.

The inherent simplicity of audio tone signalling results in simplified field servicing. All Hammarlund equipment is of modular design whereby all component assemblies plug into a basic chassis strip.

Control room of Elizabethtown Gas system. Complete remote supervision is carried over ordinary telephone lines.

Each chassis strip is made up of a power supply that is common to all units. The power supply operates on common line power of 115 v, 60 cps. As described before, the units are made up as single transmitters or receivers, dual transmitters or receivers, or as a transmitter/receiver unit. Each frequency-determining element for the transmitter units is a separate fixed-tuned item and is permanently secured to the chassis. The same is true of the receiver in which the bandpass filter element is permanently fixed to the chassis strip. Since all frequency discrimination takes place in these two units, all tone generators are alike and all tone receivers are alike and are of the plug-in design. This design philosophy minimizes the electronic association necessary for maintenance personnel and also permits rapid interchange with minimum down, or out time.

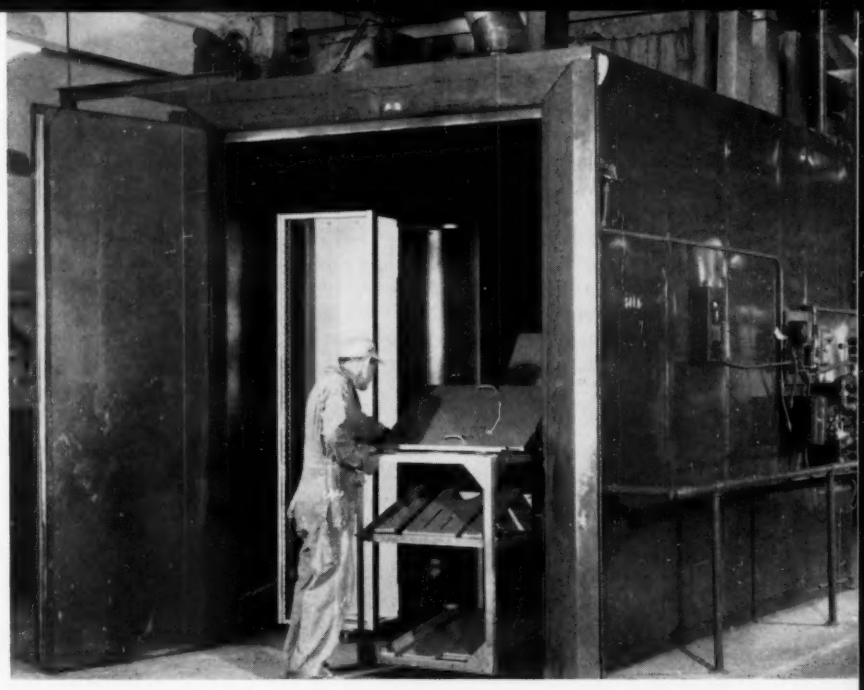
A test socket is provided on each tone unit or chassis. A test meter manufactured by Hammarlund specifically for this use, or a standard vacuum tube type, may be used to monitor the B-plus voltage of any unit, to key and monitor the output level of a tone transmitter, and to set the gain of a tone receiver unit. There is only one adjustment per channel which is normaly made upon installation. Lock-nuts are provided for each adjustment which assure semi-permanent settings. The adjustments made at the time of installation usually require no further attention even when tone plug-in packages are substituted. A single spare tone generator and tone receiver package may be used to service a complete installation. There are no critical alignment procedures in the field maintenance of this equipment. Since all operations are on a go, no-go basis, faults can be readily defined at any time.

Audio tone signalling is extremely adaptable to supervision of gas distribution. A large number of companies have this equipment incorporated in their systems at the present time and are realizing great savings in line rental costs, while increasing their efficiency.

The very nature of this equipment permits it to be used with existing telemetering and control equipment.

Most transmission circuit suppliers, whether they are telephone systems, VHF or microwave manufacturers are thoroughly familiar with audio tone signalling. It merely remains to define the frequency assignments to various stations to complete the necessary negotiations for providing a transmission circuit. ■

This article was adapted from a paper presented at the AGA distribution conference April 8-11 in Houston.



Large batch oven for use in curing finishes on parts of varying size and shape. Burners are located to the rear of the oven and heated air is forced through oven by circulating fans.

. . . What the industrial gas engineer should know about the composition and qualities of paint as well as lacquer, enamel, and varnish.

Drying paint with gas

By **B. C. VON ESCH** • Southern California Gas Co., Los Angeles

THE industrial gas engineer, in his contact with the many and varied problems involving the industrial application of gas, is often confronted with those pertaining to the drying of paint, lacquer, enamel and varnish. Although an apparently simple operation, paint drying is actually quite complex. It can be affected by many variables, such as atmospheric conditions, paint formulations, type of surface, and drying equipment.

In general, paint is a substance which, when applied to a surface and dried, forms a decorative and protective film. In most of our contacts with paints, we have seen it dried under natural conditions at ambient temperature. It was almost always done in this manner until Henry Ford and his production line methods demanded a speed-up in the paint drying bottle neck. In solving this problem by various methods of forced drying, industry found that it not only increased the speed of production, but also improved the durability and the beauty of the finish.

The forced drying method involves the use of a heat source. It is here that natural gas performs admirably one of the industrial tasks to which it is ideally suited.

We shall use the terms paint and finish interchangeably in this discussion to mean only the non-metallic finishes, although the word finish could include the metal finishes, such as chrome plating, galvanizing, etc.

Composition of non-metallic finishing materials

Before we can discuss paint drying problems with understanding, we should know something of the technical nature of paint. Most paints consist of four major ingredients: pigments, vehicles, dryers, and thinners.

Pigments: The pigment is an insoluble dry coloring matter, which, when mixed with a suitable medium, forms paint in its basic form. Common examples are white lead, zinc white, and titanium pigments. Pigments impart color and opacity to the finish. As such, however, pigments do not affect the drying process and need not greatly concern us here. A reliable paint chemist (employed by all major paint manufacturers) is usually the best judge of the particular pigment to use on any desired job.

Vehicles: The so-called vehicle is one of the most important ingredients in industrial paints. Flexibility, drying rate, hardness, durability, and many other important characteristics are governed by the vehicle. It serves as the carrier for the pigments. On mixing, it

wets them; and on drying, forms a film which binds the pigment in the finish. Linseed oil, because of rapid and hard drying, is the most common vehicle for general painting, whereas alkyd resins form the vehicles for most enamel-type finishes. Finishes using linseed oil tend to yellow rapidly while those containing coconut oil are most resistant to this effect.

Dryers: Some paints form a dry film by the process of oxidation. In a paint of this type a dryer that acts as a catalyst is often added to speed up the combination of oxygen with the vehicle. This is often necessary to bring the drying time within reasonable limits. Most dryers are metallic salts or oxides of lead, cobalt, and manganese dissolved in oil or naphthenic acids. Lead oxide is most commonly used, whereas cobalt oxide is used for very rapid drying.

Thinners: Before a paint can be applied to a surface, the solution must be thinned to the proper fluidity to insure desired flow characteristics and coverage. Thinners are added to paints to obtain this result. They are usually contained in the amount of about 40 per cent as shipped, although more is generally added just prior to application. No film-forming qualities are present in these completely volatile materials. Two of the major thinners for industrial paints are turpentine and toluene.

Drying processes

Now that we have covered the "what" in paint, let us look at the "how." The transformation of a wet paint that has been applied to a surface into a hard, beautifying, protective coating is a most interesting process. In analyzing this transformation we find it usually consists of a combination of three reactions: oxidation, polymerization, and evaporation.

Oxidation: Some paints depend on the combination of oxygen with the vehicle for their drying characteristics. This chemical reaction changes the molecular structure of the vehicle and in so doing causes the finish to "set up." All paints using an oil vehicle such as linseed oil dry partially by this oxidation process. In years past, this oxidation process took considerable time. To meet the demands for increased production rates, the paint chemist set about to shorten this phase. He accomplished this by several devices. Harder oil and synthetic resins were developed. The greatest forward strides were made, however, by the addition of dryers or catalysts and the use of an outside heat source during the drying period in the presence of sufficient oxygen to complete the chemical reaction. Thus the drying process by oxidation has been shortened from days to hours or minutes.

Polymerization: A second mechanism in the drying process is polymerization. In simple terms, polymerization is any reaction in which identical molecules combined creating new carbon linkages. For example, a molecule of propylene $CH_3 - CH_2 = CH_2$ can combine with itself to form a molecule of hexylene $CH_3 - CH = CHCHCH_3$. A third and fourth molecule may then combine with hexylene to form a long chain of carbon atoms and ultimately a tarry or resinous product. It is this reaction that occurs in paint drying. As a paint is applied, all of the components are present for polymerization to occur; none need be added. The addition of heat in this drying process acts as a catalyst and this combination of like molecules to form a hard surface is greatly speeded up. Polymers cured at high temperatures are quicker drying, more water resistant, more durable, and have a surface more resistant to abrasion than the same finish cured at ambient temperature. In addition to heat, acid is sometimes used as a catalyst to speed up polymerization, particularly in the urea-type synthetics. Polymerization plays an important role in the curing of appliance finishes. The enamel used in this equipment is of a urea-type base with alkyd plasticizers. It dries by evaporation of thinner, polymerization of the urea, and oxidation of the alkyds.

Evaporation: The simplest phase of drying is the already mentioned evaporation. In this method, a component of the paint is removed by a vaporization of the solvents. Evaporation is a part of drying of most paints. A few such as shellac and nitrocellulose lacquer dry solely by this method. The application of heat speeds up the rate of evaporation, thus helping to achieve the desired end result of increased production.

Non-metallic finishing materials

Shellac: The shellac most commonly used for pattern and varnish work is the T.N. grade, which usually contains about 3 per cent rosin. Rosin makes the shellac brittle, and the addition of about 5 per cent rosin increases the adhesiveness. Bleached shellac is generally used in lacquers, although it has less adhesive strength than orange shellac. Pure shellac is usually transparent with little color. It dries by evaporation.

Varnish: Ordinary spirit varnish is made by dissolving from 4½ lb to 9 lb of shellac in a gallon of alcohol.

Lacquer: Cellulose nitrate dissolved in butyl acetate and other solvents, and thinners are commonly used to form metal lacquers. They are usually pigmented and generally contain phenolic and glycerine phthalate resins to provide a more flexible finish. They are generally applied by spraying and dry with great rapidity, producing highly durable finishes.

Synthetics: Synthetic finishes are organic materials using synthetic resins instead of those of natural origin, as in lacquers. They are widely used on automobile finishes and are generally equal in durability and appearance to lacquer. Fewer applications are required to cover, and drying is easier than with lacquer.

Enamels: Enamels have a natural resin or varnish base. They generally dry with a glossy surface. Their drying characteristics are similar to those of lacquers.

Lacquer enamel: Lacquer enamels are simply pigmented lacquers.

Japan: Japans are a combination of bituminous materials, such as asphalt, drying oils and thinners. They previously were widely used for chassis under-coating, stoves, etc., but are little used now except for wood filler.

Vynel: The newer vynel base paints are used extensively for cement and stucco applications.

They are water repellent and generally hold their color for long periods when exposed to the weather.

Rubber: The rubber base paints that are now available are especially adopted for use where water immersion is present, such as in swimming pools.

Epon and phenol: The epon and phenol base finishes are becoming widely used for application to material that is subject to considerable handling. Wrought iron furniture is an excellent example of work using these finishes. High temperature drying is required with temperatures in the neighborhood of 500°F.

Special finishes: There are numerous special type paints that are made on order for various manufacturers. The paint manufacturer can usually produce a paint with almost any desired characteristics such as rapid drying, no fading, high durability, unusual color, flexibility, etc. The paint manufacturer's chemist is the best man to specify paint. The paint-can label usually doesn't show the composition of the paint, nor does it tell the proper method of application or drying. Paint store employees are rarely qualified to specify paint.

Non-metallic finishes

Wrinkle: The wrinkle-type finish derives its name from the actual wrinkled condition of the surface of the paint. This is a desirable finish on many products and requires some special procedures in order to obtain it. The wrinkle effect is produced by very quick surface drying. This causes the material beneath to force its way to the surface, wrinkling the entire area in doing so. The type of paint used and the rate of heating in the oven are the controlling factors in obtaining this finish. The thickness of the metal surfaces can also vary the wrinkle effect. Thick material will remain cooler on the underside as compared to thin material, and thus vary the underneath drying rate in relation to the surface

Hammertone: The hammertone finish gives the appearance of the finish having been hammered or scaled. It is obtained by applying two coats of paint of two different shades approximately 30 minutes apart. No special heating problem is associated with this type finish.

Pine tree: The pine tree finish appears as a forest of trees actually painted on the surface. Rarely used today, it is difficult to obtain with any consistency. The oven atmosphere was important in obtaining the finish as a foul condition was required.

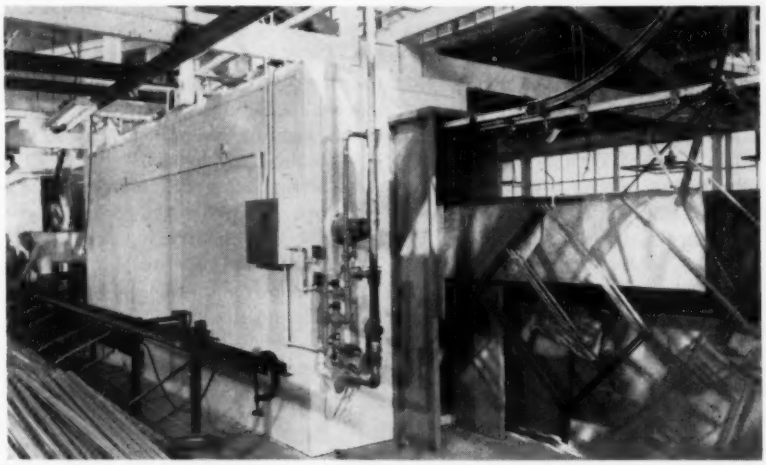
Methods of heat transfer

We now come to the actual drying operation, and we will discuss how this vastly important job is accomplished. In any drying operation there must be some method of heat transfer. Heat can be transferred in three ways—conduction, convection, and radiation. It is difficult to conceive of a piece of paint drying equipment which does not make some use of all three. Normally one method will predominate and the entire process is then classified as one of the three.

Conduction involves the transfer of heat from the hotter portion of a body or structure to the cooler portions. It is not generally of importance in the drying of paint as convection or radiant-heat transfer play by far the major roles.

If two bodies in sight of each other exist with a temperature differential between them, there will be an exchange of radiant energy. The rate at which this exchange takes place will be proportional to the difference of the fourth powers of the absolute temperatures. Thus, a slight increase in the temperature differential causes a marked increase in the rate of heat transfer. The heat exchange is also directly proportional to the amount of area exposed to the radiation. To realize maximum effectiveness then, the heat source must "see" as much of the receiving surface as possible in order to insure even heat transfer. If even baking or drying is to be accomplished in a so-called "infrared" oven, it is essential that the unexposed surfaces be cured by convection heat transfer.

Another factor that affects the radiant heat transfer is the character of the receiving surface. Black, non-glossy finishes will absorb energy at a greater rate than, for example, those with glossy white or aluminum finishes. If a given oven with a fixed time and temperature cycle will do the same drying job on various finishes, it is probably convective heat transfer that is doing the job. It is apparent that convection then is involved to some degree in all paint drying operations. In the larger portion of such operations, it is the primary mechanism of heat transfer.



Material is dried in this double-pass drying oven on the first pass after it has gone through a bonderizing cycle. The material then passes through the spray booth and is cured on the return pass. Burners are located on the front of the oven and fire parallel to the line of flow.

This article is adapted from PCGA Industrial Utilization Data Bulletin 167, November 1956.

Types of drying

As discussed before, we have two primary methods of drying paint. Radiation can be applied by radiant gas burners or by infra-red lamps mounted in special reflectors. Convection heating can be applied by a suitable source of heat together with the necessary fans and duct system to convey the hot gases to the work surfaces. Discussion has been very great among engineers and manufacturers as to the benefits to be derived by using one method or the other.

Since speed of cure is usually the primary goal, we must consider each method chiefly from this standpoint. It is generally accepted that each paint formulation has its own particular length of time at a particular temperature to cure, provided that there is sufficient air present to complete oxidation if necessary, and to carry off evaporated thinners. The method of heat application has no bearing on this relationship of time at temperature. The only factor that will vary the speed of doing a particular paint drying job is the time spent in bringing the finish to maximum curing temperature. This is the heart of the problem of fast paint drying.

Radiant: Proponents of infra-red drying claim it to be the best solution to this problem by virtue of the high thermal head between lamp and work. In practice this works very nicely in those applications where work processed is generally in flat sheets, thus permitting an equal distribution of the radiant energy. Where the work processed is of varying shape, causing shadows, and air circulation is necessary to provide oxidation and venting of volatile thinners, then a cooling effect is noted. In essence, the curing is by convection heat transfer. In the past, designers of convection ovens have been inclined to be conservative in the use of high temperatures and used large amounts of air circulation. The newer finishes will withstand the higher curing temperatures thus allowing the convection oven the advantage of a relatively high thermal head to shorten the time to reach maximum curing temperatures. Gas-fired radiant tube drying ovens will perform the same type of drying as infra-red electric ovens. They will give the same heat transfer, atmosphere and control. In addition operating expense — in fuel and maintenance—is much less. In considering an increase in speed of drying, it might be well to consider the added cost of a faster drying paint as against the savings realized in faster production.

Batch oven: Paint drying equipment being used in industrial plants is a wonder in variety. It varies from the crude "home-made" batch oven to the skillfully designed conveyor types with automatic zone control.

Let's first discuss the gas-fired convection oven. The simplest type is a direct-fired box-type batch oven using natural convection. It is suitable for core baking, heat treating, certain Japan and enamel finish baking operations and a wide variety of other heating operations at temperatures up to 1200°F. Generally it is constructed of an outside shell of galvanized steel, approximately 3 in. of insulating material, and an inner shell of black steel. The burners may be atmospheric venturi pipe or ribbon burners situated along the floor of the oven. In most cases where combustion control is desirable, a premix burner is used. Care must be taken when using this type of oven to insure sufficient circulation to carry off the vaporized thinners. This is normally 1 sq ft of vent per 15 cu ft of oven volume. Also, if the finish being cured is of the oxidizing type, the air-gas ratio must be such that sufficient excess air is present to carry on the oxidation process. Forced ventilation should always be used unless the oven is less than 200 cu ft in volume and always operates above 400°F.

Modern convection: Modern convection ovens, however, are generally fired with an automatically controlled, fuel-fired air heater mounted adjacent to the oven. This type of oven has obsoleted the direct-fired natural convection oven. They may be designed to use direct fire or indirect fire. A direct-fired forced convection oven is one in which the products of combustion intermix with the circulating air. It can be used for curing finishes where fouling is of no particular problem. An indirect fired oven is one in which the combustion chamber is vented and the heat exchange medium, which is air, is permitted to absorb heat from the outside of the combustion chamber and then diverted into the oven. As a rule, the major portion of the hot gases are recirculated. Only a sufficient volume is vented to insure a mixture of the volatiles which is well below the explosive range. Recommended ventilation is 10,000 cu ft* of fresh air or more per gallon of volatile entering continuous ovens and 380** cfm of fresh air or more per gallon of volatile carried by each load in batch ovens.

Fouling: When considering a burner application for this type of oven, careful thought must be given to the type of finish it will be called upon to cure. If the finish is sensitive to fouling caused by changes in combustion or foreign materials such as dust or other local contaminants, then the indirect heating system must be considered. In general, a pre-mix combustion system is preferred for either a direct or indirect oven. It gives the operator more control over combustion efficiency and it permits use of filtered air or air taken from a contaminant-free sources.

Oven design and operating characteristics

There are many factors that will affect the drying of painted surfaces. These may be the composition of the paint, the method of application, the time between painting and entry to the oven, humidity in the oven, type of oven (radiant or convection), oven atmosphere, length of time in the oven, and temperature in the oven.

Humidity: Humidity is not a problem in direct-fired gas drying ovens. Even on a humid day with a high percentage of recirculated air in the oven, the relative humidity will usually be well under 10 per cent.

Material weight: In a drying oven the weight of the material

* Article No. 410, National Board of Fire Underwriters.
** Article No. 420, National Board of Fire Underwriters.

FACTS FOR CALCULATING OVEN INPUT

Calculation of Oven Input—Facts required:

1. Gallons of solvent used (total for batch oven, per hour for continuous oven).

2. Weight of material painted (total for batch oven, per hour for continuous oven).

2a. Specific heat of material.

3. Temperature (maximum) required in oven.

3a. Ambient temperature.

4. Construction and dimensions of oven.

4a. Coefficient of heat transfer.

5. Cubic feet of fresh air input per hour (including temperature).

6. Cubic feet of recirculated air per hour (including temperature).

7. Cubic feet of vented air per hour (including temperature).

8. Cubic feet of leakage air (including open ends in continuous oven) per hour (including temperature).

9. Length of time required in oven.

Method of Calculation

Heat Loss 1 =

Gal. per hr $\times$ 10,000 $\times$ t $\div$ 55 = Btu input required, per hour

or Gal. $\times$ 380 $\times$ 60 $\times$ t $\div$ 55 = Btu input required, per hour

Heat Loss 2 =

Lb per hr $\times$ Specific heat $\times$ t = Btu input required, per hour

or Lb $\times$ Specific heat $\times$ t = Btu input required, per batch

Heat Loss 3 =

Total surface area $\times$ k $\times$ t = Btu input required, per hour

Heat Loss 4 =

CFS (recirculated air) $\times$ t $\div$ 55 = Btu input required, per hour

Where

*10,000 = cubic feet of fresh air used for ventilation for each gallon of solvent evaporated per hour.

*380 = cubic feet of fresh air used per minute for ventilation for each gallon of solvent in the batch.

t = differential in temperature, oven to ambient.

55 = number of cubic feet of air raised 1°F. with one Btu.

60 = minutes per hour.

k = coefficient of heat transfer through oven walls to ambient.

* Recommended by National Board of Fire Underwriters.

painted will make a difference in the temperature obtainable and the amount of heat required to properly complete the drying cycle. Large, heavy objects will absorb more heat than light ones and thus require more heat input from the burner.

Zoning: In continuous ovens, provisions should be made for zoning. For example, there should be a preheat zone in which the work is brought up to temperature and volatiles taken off; a holding zone for baking; and a final finishing zone for cooling and possible hardening.

Both the entrance and exit ends should be provided with air curtains to prevent volatiles spilling into the plant and excess heat escaping from the oven.

Ducting: The method of air ducting in a convection oven is very important. The vapors from paint volatiles are generally heavier than air and bottom venting requires prime consideration. As heated air naturally tends to rise. it is important to have air circulation such that hot spots and horizontal zoning are avoided. Varying temperature in a paint drying oven is the cause of many poor and inconsistent finishes.

Input: To properly calculate the required heat input of a paint-drying oven, one must know the paint composition; gallons of solvent per hour; weight of material per hour; amount of fresh air used; amount of air recirculated; heat loss through the sides, top and bottom of the oven; heated air loss through leaks and end openings; amount of air vented; temperature required; and length of drying time desired. See accompanying table for calculation of heat input and method of calculation.

Advantages of gas

Gas fuel has proven to be the most satisfactory, convenient and economical fuel to use for all types of paint drying. Although many are of the impression that certain types of finishing can only be done in electric ovens, this is far from true. Gas-fired ovens are made in so many varieties that no presently known finish cannot be excellently cured in them. Direct-fired convection ovens for finishes requiring fouled atmosphere or high CO_2 content are available; indirect convection ovens for controlled pure atmosphere are available; and radiant tube ovens for those who are proponents of the infra-red method are also available.

The ease of complete control, the low maintenance cost, the low operating cost, and the excellent and wide performance range indicate the gas-fired drying oven to be the wise choice over any other type of drying oven.

Equipment selection

This briefly is the general classification of oven equipment in use for paint drying. However, each paint drying job presents its own individual problem, which quite often is best solved by custom design. It cannot be too heavily stressed that consultation with competent oven engineers is the surest road to successful oven design.

In designing a paint drying oven, the engineer must consider every phase of the problem. Most im-

portant, of course, is the product to be processed—its size, shape, material and volume to be handled. Secondly, what are the characteristics of the finish to be applied? The paint manufacturer or chemist must be consulted here. Next item to decide is what type of oven will it be—a batch oven with racks, or a continuous conveyor oven. Local conditions must be investigated, such as which fuel is most desirable and also available. (Flexibility, ease of control and economy should be considered here.) Space available in the plant is also an important factor. Provisions for safety equipment should certainly be included in the design. The National Fire Protection Association has excellent regulations covering oven design. A study of all of these factors plus the application of sound engineering practice will produce an oven best suited to handle any particular paint drying problem.

Safety precautions

It is assumed that the industrial gas engineer is thoroughly familiar with safety procedures and the possible dangers associated with the highly inflammable characteristics of paints and its vapors.

Obvious care should be taken in lighting a paint drying oven, and smoking and other open flames should not be permitted in the area. Even though a well designed oven should be equipped with sufficient safety devices, there remains the possibility of explosion if all proper precautions are not always followed. The Associated Factory Mutual Fire Insurance Companies, through their Factory Mutual Engineering Division, have made available a number of very informative bulletins that deal with explosion prevention in gas-fired drying ovens.

Field problems

Some of the most common problems encountered in the field, their causes and suggested solutions are:

Black spots on finish: discoloration of the finish by black spots is most likely due to poorly maintained working areas causing dirt to get into the air stream. In dirty or dusty locations, both the air for combustion and the air for ventilation should be filtered.

Blush finish: This term refers to haziness or an opacity in clear lacquers or enamels, or sometimes a relatively dull finish where a high gloss is desired. It is caused by a rapid evaporation of the solvents which traps moisture in the film. It can also be caused by an improper solvent balance. The first conditions will seldom occur in ovens that are heated unless there is an excessive amount of moisture present. Improper solvent balance is caused by one solvent evaporating faster than the others which leaves an excessive amount of solvent in which the material is only slightly soluble. It can be corrected by using a less volatile thinner or using solvents in which the material is more soluble.

Discolored finish: Discolored finish may be caused by the presence of sulfur in the finishing material or in the combustion products or atmosphere. It can also be caused by hot spots in the oven which may be due to oven design or adjustment.

Dull finish: A dull finish is normally caused by very small wrinkles visible only under a magnifying glass. It may be caused by the formation of carbonic acid (CO_2 and water vapor) on the surface. The carbonic acid acts as a catalyst for polymerizing paints, thus causing uneven curing. It can also be caused by acid fumes from plating tanks or degreasers. It can be corrected by removing acid-forming operations from the painting area. The use of an indirect-fired oven will eliminate the possibility of excess CO_2.

Orange-peel finish: This finish imperfection is easily recognized as having an orange peel or pebbly appearance. Incorrect mixing of paint and thinner or poor spray gun adjustment can be a source of trouble. It can often be corrected by use of a less volatile thinner.

Paint won't dry: In cases where the finish will not cure, the temperature is probably too low or the time in the oven is too short for the particular finish being used. This is often noticed in changing the drying cycle. Another cause would be the application of too thick a paint film.

Pin-holing or bubbling: This is usually caused by allowing the work to enter the high heat zone so rapidly that the surface sets rapidly and the solvent beneath it forces its way through, causing pin holes and bubbles. This can be prevented by allowing more time in raising the temperature of the work in the oven.

Sagging: Sagging of the paint usually occurs on the vertical portions of the part and in the corners. It is caused by too much paint, improper thinner, or a too rapid rise of temperature.

Uneven drying: Uneven drying may be caused by poor distribution of heat due to insufficient circulation of the air. Parts having considerable difference in thickness may also cause uneven drying. In radiant ovens a similar condition may be caused by the so-called shadow effect where one part is prevented from receiving its correct amount of radiation due to shadows. A damper adjustment, or a change in ducting or blower capacity may be necessary to correct this trouble. Very odd shaped pieces may not properly dry in a radiant-type oven.

Variation in hardness: Variation in hardness from time to time in the curing of a finish could be caused by varying thickness of film due to poor application, changes in oven temperature, length of time in the oven, or lack of sufficient ventilation to oxidize the oils.

Wrinkles: Wrinkles in a finish which are large enough to see may be caused by four conditions: (1) too much dryer, (2) an excess of china wood oil, (3) too much oxidizing oil, (4) an excess of heat applied to the material when it first enters the oven. The first three are caused by the paint formula and can be corrected only by the manufacturer. The fourth is caused by improper design or use of the oven.

When difficulties are encountered in the field, it can usually be shown that the causes of trouble are 50 per cent paint composition, 25 per cent application, and 25 per cent oven atmosphere. Never underestimate the assistance, and the willingness, of a paint chemist in helping to solve your problems in paint drying. ■

Canadian Report

THE GAS INDUSTRY IN CANADA

By FRANK CHAPMAN

Montreal can be Canada's biggest gas-consuming area

GIVEN a competitive price and quality salesmanship, the Greater Montreal area promises to become Canada's largest natural gas consuming area. This, at least, is the philosophy of those who are destined to guide the future development and growth of the natural gas industry in the area.

At the present time the Montreal metropolitan area is Canada's most populous by nearly 300,000 persons. At the close of 1956 the area reported a population of about 1.6 million. Toronto, second in population, recorded nearly 1.35 million. Beyond this, however, Montreal has more multiple unit dwellings and a greater density of population than any other city in the dominion. To a gas distribution company serving the area, this means there are more potential customers per foot of main than are to be found in any other Canadian city.

In March of this year, the Quebec Lower House gave third and final reading, by a vote of 57 to 13, to a government measure authorizing the Quebec Hydroelectric Commission to sell its gas distribution system in Montreal. Quebec Natural Gas Corp. has an option to purchase the gas distribution business for approximately $25.5 million. The company also has an option to acquire all the properties of Montreal Coke for $7.2 million in cash and the assumption of $2.1 million of first mortgage bonds due in 1963.

Quebec Natural has filed with the Securities & Exchange Commission a registration statement covering its first public financing proposed in relation to its incorporation as a gas operating utility. The securities and amounts registered include $25 million in first mortgage bonds due in 1980, $15 million in subordinated debentures due in 1985, and $750,000 common shares at $1 par value.

Historically, the first gas plant in the city of Montreal, called the Montreal Gas Light Co., began supplying gas in 1837. The plant was among the first to be placed in operation on this continent. Business prospered and other gas companies were formed until, shortly before the turn of the century, all the city's gas companies were merged to form the Montreal Gas Co.

In 1901 the Montreal Gas Co. was merged with the Royal Electric Co. to form Montreal Light, Heat & Power Consolidated. The provincial government in 1944 expropriated the company and it became the Quebec Hydroelectric Commission.

At the present time the company supplies 465 Btu manufactured gas from a coke plant and from water gas sets. Current sendout is around 8 billion cu ft annually, with maximum day sendout running over 30 MMcf. The company supplies around 253,000 customers, including about 240,000 residential and 13,000 industrial and commercial customers. The existing system is made up of 918 miles of gas line, including 78 miles of transmission line and 840 miles of city distribution system.

Some 38 miles of high pressure transmission line will be constructed from the Trans-Canada Pipeline connection point near Ste. Anne de Bellevue at the western end of Montreal Island to transport gas to distribution centers. An extensive program of expanding and improving the present system is planned in order to serve new industrial and residential areas. Estimated cost is $5 million.

The Montreal operation is beset with competition from both oil and electricity. At the present time, light oil is used for heating in a large number of better class Montreal homes. Current rate for this fuel is around 18.3 cents per Imperial gallon, which is the equivalent of $1.08 per Mcf of 1000-Btu gas.

Homes burning coal for heating use a blower grade at $23.75 per ton, or about 70 cents per Mcf of equivalent 1000-Btu gas. Indications are that natural gas will be able to take over some househeating business from both coal and oil in the older homes where existing equipment is in need of replacement or major repair. However, newer homes with modern oil or coal burning equipment are not considered good prospects for conversion to natural gas in the near future.

The most promising immediate load for natural gas appears to be in the conversion of the great many kerosene room heaters currently in use in the city's multiple family dwellings. Kerosene sells in the area for about 24 cents per Imperial gallon, or a 1000 Btu equivalent of $1.26 per Mcf. The kerosene heater is used extensively in three- to five-family dwellings in the Montreal area. The unit is supplied either from a tank in each flat or from a common drum for the entire building. In making a conversion to natural gas the burner would be changed while the heater would remain.

Electricity supplies the city's current cooking and water heating load for the average private home. The extent to which natural gas will be able to compete with this business depends entirely upon the eventual price of gas.

Industrial and commercial establishments in the area using light oil or coal are promising prospects for conversion to natural gas, particularly in those instances where cleanliness is a factor. On the other hand, the heavier industries using Bunker C oil or bituminous coal, known as Sidney slack, will offer stiffer competition to natural gas. Bunker C is currently selling for around 9.6 cents per Imperial gallon, or the equivalent of 54 cents per Mcf for 1000-Btu equivalent gas. This price is subject to reduction if natural gas should become competitive. Sidney slack sells for around $13.86 per ton, or the equivalent of 50 cents per Mcf for 1000-Btu gas.

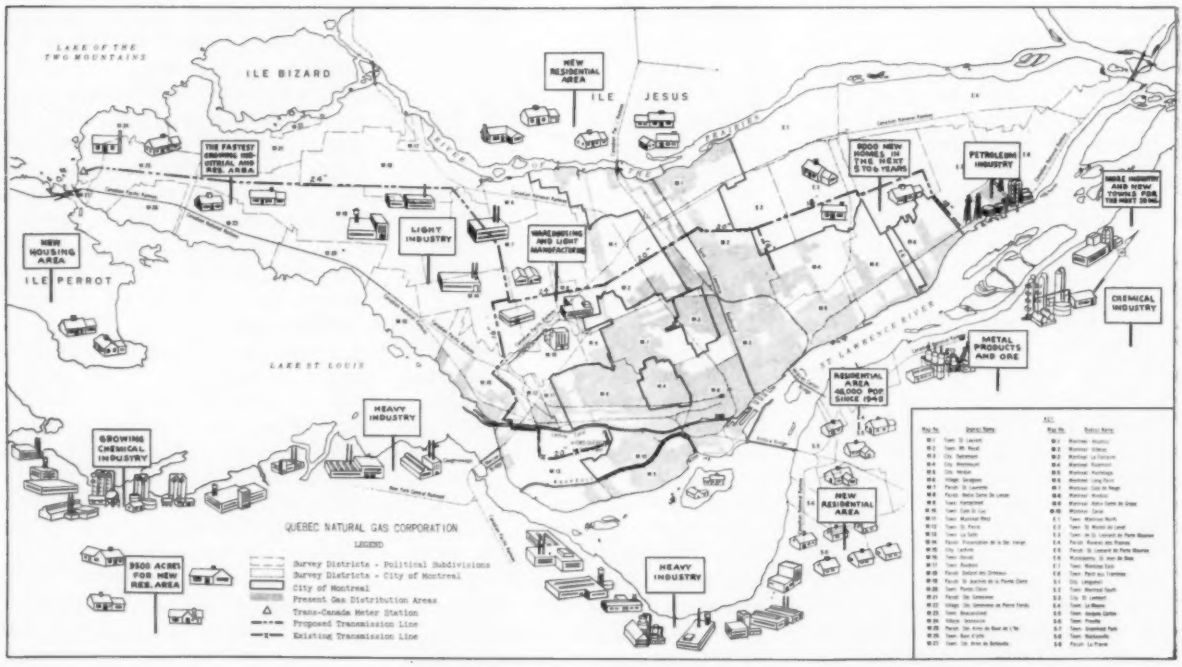
With the arrival of natural gas in the Montreal area still some time away, the factors affecting gas sendout and number of customers are difficult to define. The most important single factor, the eventual price of gas, depends upon the costs of purchasing and transporting natural gas from western Canada. Also an unknown factor is how the competitive fuel price picture will shape up when natural gas makes its appearance on the Montreal scene.

Nonetheless, estimates have been made as to the expected growth of the natural gas industry through the five-year period after it is made available. The requirements for the first year of natural gas are estimated at about 30,000 MMcf. During the fifth year it is estimated that annual sendout will exceed 40,000 MMcf.

It is estimated that the company will have about 286,000 customers in the fifth year after conversion. This is divided between an estimated 267,000 residential, 18,600 commercial and 315 industrial users. Conservative estimates are that the company's annual residential load will increase from around 4000 MMcf in the first year to about 10,000 MMcf in the fifth year. Maximum daily requirement in the fifth year is estimated at between 100 and 115 MMcf.

As to the estimated househeating load with conversion to natural gas it is contemplated that during the first year there will be a 2 per cent saturation of gas furnaces, a 10 per cent saturation of furnaces and stoves, and a 5 per cent saturation of furnace equivalents. In the fifth year it is estimated that there will be a 10 per cent saturation of gas furnaces, a 25 per cent saturation of furnaces and stoves, and a 15 per cent saturation of furnace equivalents.

An indication of the growth potential for natural gas in the Montreal area may be had from an analysis of the economic health of the region. The 228-square mile area defined as Greater Montreal comprises the 200-square mile



Decentralization of industry is anticipated along the river and on both sides of the city of Montreal.

Island of Montreal, plus the south shore localities of Jacques, Cartier, Longueuil, St. Lambert, Greenfield Park, Le Moyne, MacKayville, Montreal South and Preville, together with the north shore localities of Abord-a-Plouffe, Laval - des - Rapides and Pont-Viau. The city of Montreal has an area of 50 square miles.

The 1955 population of the Greater Montreal area was 1,575,762, an increase of about 10 per cent over the area's 1941 population. Current estimates predict a population of 1.9 million for the Greater Montreal area by 1961, and nearly 2.5 million in 1971. The 1955 population of the city of Montreal was just slightly over one million persons. Growth is expected to bring this figure to nearly 1.2 million in 1961 and over 1.3 million in 1971.

New dwelling units have been increasing in the Montreal area at the rate of about 20,000 units a year over the past few years. It is estimated that there will be 319,000 private dwelling units in the city of Montreal by 1961, and 368,000 by 1971. In the Greater Montreal area dwelling units are expected to equal 514,000 by 1961, and 683,000 by 1971. City building permits for 1955 totalled $164 million, while building contracts awarded in the Greater Montreal area totalled some $370 million in the same period.*

Because of its strategic location in the St. Lawrence river, Montreal has long been a major element in the world's shipping industry. With the completion of the St. Lawrence waterway project it is expected that the city's importance as a shipping center will be enhanced.

In industry the area is expected to go through a rather substantial decentralization. Major chemical, petrochemical and other industry is locating along the river on both sides of the city of Montreal. New housing developments and shopping centers are following this trend, resulting in the rapid growth of urban satellite areas. ■

* For additional detailed information on the Montreal economic position refer to "Memorandum Submitted to The Royal Commission on Canada's Economic Prospects on Behalf of the City of Montreal," by His Worship Jean Drapeau, Mayor of Montreal; February, 1956.

GAS news

Equitable's management rated excellent

Equitable Gas Co.'s ability to seize upon new ideas has helped the Pittsburgh-based company win a rating of excellence in management from the American Institute of Management.

Just seven years after an SEC order released control of Equitable to the public, the company has shown what it can do in the face of somewhat unusual competition for a utility, a "management audit" study of the company reveals. Not only was Equitable one of the first utilities in the country to store its surplus natural gas in underground storage, but it has pioneered in establishment of subsidiaries like hydrocarbon production, which free it from some of the burden of government regulation.

Equitable scored 8250 points of a possible 10,000 on the institute's comparative rating scale. The scale measures companies against their own performance, against their competitors and against business as a whole. Minimum for excellence is 7500 points. Health of earnings, while important, is but one of the 10 basic categories under which the institute appraises a company's management performance. Equitable scored well in each of them—economic function, corporate structure, service to stockowners, research and development, directorate analysis, fiscal policies, production efficiency, sales vigor and executive evaluation. Another area in which Equitable has pioneered is establishment of a department for economic and management research.

In its appraisal of the company's executive team, the institute credits its President Albert W. Conover for direction of these policies. Twice president of the Pittsburgh Chamber of Commerce since he took over as president of Equitable seven years ago, Mr. Conover is slated to become president of the AGA soon.

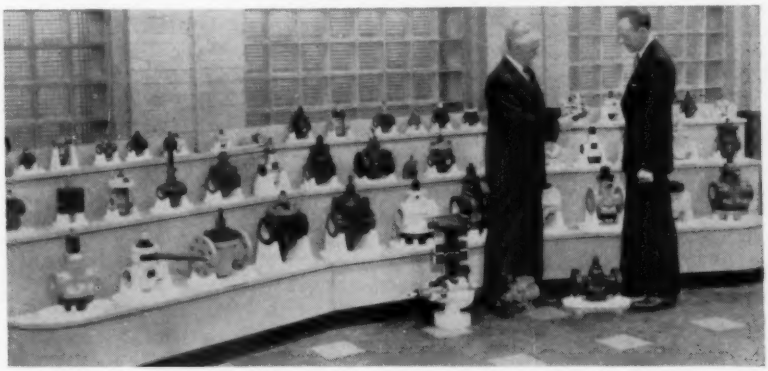
As further evidence of forward looking policies, the institute cited Equitable's part in promoting sale of gas appliances. The two other Pittsburgh gas companies join with Equitable in a common effort to boost gas appliance sales.

Gas course offered by Canada's Ryerson Tech

A three-year course in gas technolgy is being introduced into the curriculum of the Ryerson Institute of Technology in September, according to the Canadian Gas Association.

The course, first of its kind in Canada, is designed to train engineering technicians for Canada's rapidly expanding natural gas industry.

The history of the lubricated plug valve is shown in the unique valve museum opened by Rockwell Manufacturing Co. at its Barberton, Ohio, plant. Displayed are drawings, cutaways and working models showing progress in designs and types from Sven Nordstrom's original lubricated plug valve of 40 years ago to today's highly developed models. Here, Ernest Fallows, assistant general manager of the Barberton plant, shows Thomas Gettig, assistant to the vice president in charge of the meter and valve division, a cutaway model.



The course will embrace a wide range of subjects such as engineering drawing, pipeline design, instrumentation and control, combustion principles, gas utilization, corrosion control, welding, metallurgy and gas analysis.

A 12-page brochure entitled "Pipeline to Success" has been prepared by the Canadian Gas Association for distribution to high school students throughout Canada to stimulate their interest in taking the course.

Industry's '56 tax bill 31 per cent over income

The gas industry's tax bill for 1956 was 31 per cent greater than the net income of the industry.

According to the report from the American Gas Association, taxes for the year reached $780 million, nearly 13 per cent above the previous net. Net income was $597 million compared with $524 million in 1955.

Total operating revenues of the industry climbed to $5.9 billion, a gain of $661 million or 12.6 per cent over 1955. Net operating revenues increased 10.4 per cent, from $684 million to $755 million.

Total operating revenue deductions of $5.14 billion represented 87.2 per cent of total operating revenues, slightly higher than in 1955 when deductions of $4.55 billion amounted to 86.9 per cent of revenues of $5.23 billion.

Gas utility sales to ultimate customers produced revenues of $3.8 billion in 1956. This was an advance of 11.8 per cent over the 1955 figure of $3.4 billion.

Sales aggregated 71,653 million therms in 1956, an increase of 7.2 per cent over the 66,834 million therms sold in 1955. Natural gas sales totaled 68,350 million therms, a gain of 7.0 per cent over sales of 63,337 million therms of natural gas in 1955. This produced revenues of $3.4 billion, 14.5 per cent above 1955 revenues.

Customers served through utility mains at year's end totaled 29.9 million, in addition to about 209,000 customers receiving LPG through utility mains. This was an increase of 3.1 per cent over the 28.9 million utility gas customers served at the close of 1955.

Natural gas customers at the close of 1956 aggregated 26.3 million and represented 88 per cent of all gas industry customers. A year earlier there were 23.8 million natural gas customers, 82.3 per cent of total customers.

N. Bernard Gussett, president of Iowa Power & Light Co., Des Moines, watches connection of a gold meter at the start of ceremonies marking the installation of the 100,000th meter by the 100-year old firm. Des Moines Gas Co., forerunner of Iowa Power, was organized in 1857. The gold meter was furnished by American Meter Co.

Con Edison looking to heating for big revenues

Consolidated Edison Co. has set its sights on increasing its gas revenue by $4.7 million annually from new gas heating equipment installations this year in its 439-square mile New York City and Westchester gas service area.

Con Edison's new gas revenue goal for 1957 exceeds last year's gains which, in turn, surpassed what the company had hoped to achieve, according to J. C. Murtha, sales promotion manager.

New gas heating installations in 1956 represented additional annual revenue of $4.6 million.

Lone Star installs 200,000th meter

Lone Star Gas Co. recently installed the 200,000th meter in its service area, marking the event with a gold-plated gas meter.

The gold-plated meter went into service at a ceremony attended by top-ranking company officials and the city supervisor of public utilities.

The occasion represented a new landmark in fast-growing Lone Star history, which installed its 100,000th meter in Dallas a little more than 11 years ago.

In addition to the fancy meter, the company presented the lucky family with a new gas refrigerator. This completed the kitchen which already had a built-in gas range and oven-broiler.

Ark La forms subsidiary to use dump gas

Arkansas Louisiana Gas Co. will build a $15 million cement plant at Foreman, Ark., through formation of a wholly owned subsidiary. The plant will use gas which otherwise would be wasted during the slack season. The plant will close during the winter months of peak demand.

Ten MMcf/day of natural gas, now sold as "dump gas," will be used by the new plant. The new subsidiary will buy gas from Ark La at 22.5 cents/Mcf, which is 2.5 cents/Mcf above the company's regular rate for a large volume of the gas it sells.

Program announced for corrosion short course

Fundamentals, intermediate and advanced studies in the applications of corrosion control will be covered by the 2nd annual Appalachian Underground Corrosion short course. The three-day session will be held June 4-6 at West Virginia University, Morgantown.

Some of the subjects to be covered include fundamentals of corrosion, visual demonstration and discussion of corrosion and cathodic protection, demonstration of the theory of cathodic protection, application of cathodic protection, coal tar coatings, rectifier installation, stray current corrosion, asphalt coatings, coating fundamentals, duties of a coating inspector, inherent resistance of cast iron pipe to corrision, plastic pipe, corrosion control for gas distribution systems, expendable anode fundamentals, corrosion control for construction personnel, rectifier units for cathodic protection, and many more.

Following registration for the course, an address of welcome will be made by G. R. Spindler, director of the School of Mines at West Virginia. Dr. W. F. Fair Jr., past president of the NACE and coating consultant for Koppers Co., will be keynote speaker.

Exhibits will be shown during the course and field demonstrations will be held.

(*Continued on page* 90)

ROBERTSHAW'S NEW HC-E HI-CAPACITY GAS HOME HEATING CONTROL

Home owners love the silent comfort and convenience when their central gas heating is equipped with the new Robertshaw *HC-E!* Robertshaw's new "silent watch" actuator works on an entirely different principle to insure positive, *noiseless* operation. The actuator assembly is factory adjusted to give a 20 second actuating delay... eliminates valve stuttering or "cycling." Keeps silent... and safe! It's two controls in one—automatic pilot with thermomagnetic, 100% gas shut-off, built-in pilot filter, pilot adjustment—and noiseless, positive snap-action gas valve! For more information, consult the capacity chart, fill out and mail the attached coupon!

Factory-adjusted 20 second delay stops valve stuttering or "cycling"

New "Silent Watch" Actuator replaces Solenoid... insures quiet, dependable operation!

CAPACITY LISTED BY A. G. A. AT 1" PRESS. DROP				
CAPACITY B. T. U. PER HOUR				
TYP. GAS	GASES B. T. U. PER CU. FT.			
	LESS THAN 800		MORE THAN 800	
	½ x ½	¾ x ¾	½ x ½	¾ x ¾
NAT.			254,000	315,000
MFD.	172,000	213,000		
L.P.			543,000	672,000

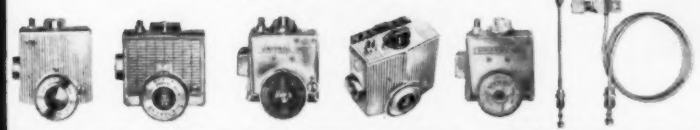
For more information...mail today!

Robertshaw-Fulton

Mr. Controls

CONTROLS COMPANY

GRAYSON CONTROLS DIVISION
Long Beach, California



UNITROL WATER HEATER & SPACE HEATER CONTROLS • THERMOCOUPLES & PILOTS

ROBERTSHAW-FULTON CONTROLS COMPANY
GRAYSON CONTROLS DIVISION
LONG BEACH, CALIFORNIA

Please rush me additional information concerning the new HC-E Hi-Capacity gas home heating control.

Name_____

Company_____

Title_____

Address_____

City_____ Zone____ State_____

Another Big-Inch pipeline goes Polyken

88 MILES OF NEW 20" LINE IN THE PEOPLES GAS LIGHT AND COKE COMPANY SYSTEM TO BE WRAPPED WITH POLYKEN POLYETHYLENE TAPE

(from Wise County, Texas, to Carter County, Oklahoma)

Natural Gas Pipeline Company of America, subsidiary of Peoples Gas of Chicago, chooses this top quality coating and The Polyken Method which provides these 7 cost-cutting advantages:

1. Tremendous labor and equipment savings because of simplified operation.
2. Faster construction—consistent high daily output.
3. No hot dope preparation—tape is ever ready.
4. No cooling or drying time.
5. Vastly reduced warehousing, shipping, handling costs.
6. Liabilities virtually eliminated—no fumes, no burns, no need to worry about human and livestock hazards.
7. Wrap goes into ground in factory-uniform condition.

To talk over your project—write, wire or phone *Polyken Sales Division*, 309 W. Jackson Blvd., Chicago 6, Illinois. Webster 9-7100.

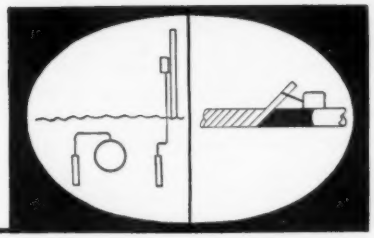
Polyken®

PROTECTIVE COATINGS

THE KENDALL COMPANY
Polyken Sales Division

Corrosion Prevention

DISTRIBUTION • TRANSMISSION



By MARSHALL E. PARKER

Soil resistivity and coating conductance—2

LAST month we made, and attempted to defend, the statement that *total measured conductance* (of a pipeline coating) *is directly proportional to the mean conductivity of the adjacent soil.* This is true because the major part of the conductance we measure is that within the moisture-filled holidays in the coating, in series with the soil; and, since the current density in the soil diminishes rapidly with increasing distance from the pipe, only the adjacent soil is important.

By far the most common practice in reporting the electrical characteristics of soil is the use of its *resistivity.* In the statement made above, the *conductivity* was used; this is merely the reciprocal of the resistivity. The choice was made because it is easier to say, and clearer to read, that *conductance is directly proportional to soil conductivity* than that *conductance is inversely proportional to soil resistivity,* although the two statements say exactly the same thing. The difference goes deeper than that, however, and we encounter it as soon as we try to average a set of measured values of resistivity or conductivity. Suppose we have a set of six values, as tabulated below. We wish to find the mean.

Ohm-centimeters	Micromhos per cm.
200	5,000
250	4,000
167	6,000
400	2,500
10,000	100
25,000	40
6) 36,017	6) 17,640
6,003	2,940

But 6003 ohm-cm is not at all equivalent to 2940 micromhos per cm! Actually, 6000 ohm-cm is the same as 167 micromhos per cm. Which of these two widely differing quantities is the correct mean? There is no obvious reason why we should use either resistivity or conductivity; both are equally meaningful; the choice seems to be arbitrary. But obviously we cannot use simple arithmetic averaging on them interchangeably. If one is right, the other is wrong.

Most corrosion engineers, when plotting resistivity profiles of a line, have adopted the practice of using a logarithmic scale for the resistivity. This has been justified on the purely practical grounds that a linear scale submerges the low values—the ones which are most important—into relative obscurity. It can also be justified on the grounds that it is the relative values of resistivity which are really important; there is really little difference between two soils of 20,000 ohm-cm and 21,000 ohm-cm, but there is a great deal of difference between soils of 200 ohm-cm and 1200 ohm-cm; yet in each pair, the difference is 1000. The difference, it can be seen, is not nearly as important as the ratio. When we plot on logarithmic paper, we make equal ratios appear as equal distances.

Few engineers have used soil conductivities, largely because all of the available instruments are calibrated in resistivity. If we do go to conductivity, we find that a linear scale gives very much the same problem, but at the other end of the scale. Then, if we plot conductivity on a logarithmic scale, we find that our two plots are the same! The resistivity plot and the conductivity plot of the same data are mirror images of each other.

Herein lies the clue to our dilemma. What we need is not the arithmetic average, but the *geometric* or *logarithmic* mean of the observed values. We could get this, in the case of our six readings, by multiplying them all together and then extracting the sixth root of the product. A simpler method is by the use of logarithms. We add up all of the logarithms, divide by the number of readings, and find the antilogarithm of the average. We can do this either with resistivities or conductivities, as in the example (values are the same as used before):

Log resistivity	Log conductivity
2.301	3.699
2.398	3.603
2.223	3.778
2.602	3.398
4.000	2.000
4.398	1.603
6) 17.922	6) 18.081
2.987, which is the log of 970 ohm-cm.	3.014, which is the log of 1,033 micromhos per cm.

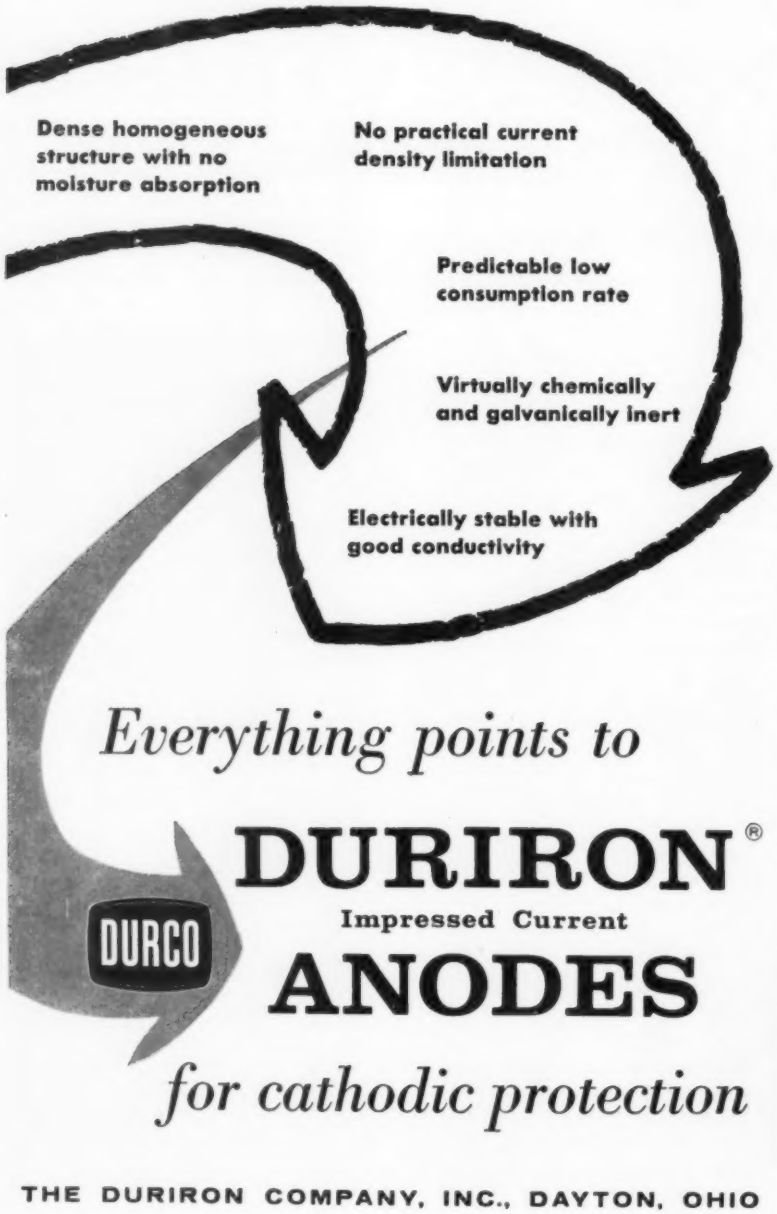
And, 970 ohm-cm resistivity is precisely the equivalent of 1033 micromhos per cm conductivity. Further, looking at the familiar

(*Continued on next page*)

resistivity values in the first table, and thinking in terms of corrosion, 970 ohm-cm sounds like a much more reasonable mean value than does 6003 ohm-cm.

A corollary of this logarithmic approach is the method of selecting boundary values for equi-resistivity maps of areas. A set of values which differ by a constant ratio should be chosen, such as 125, 250, 500, 1000, 2000, 4000, etc., instead of a set with a constant difference. The use of the latter results either in a crowded mass of meaninglessly fine divisions in the high resistivity part of the map, or in the lumping together of values which should be shown separate, in the low resistivity areas.

The value 1000 is selected as the "pivot point" in such a system, because 1000 ohm-cm is equivalent to 1000 micromhos per cm. This also furnishes a convenient method of remembering the conversion factor. ■



GAS people

J. T. Wolfe
Baltimore Gas

Lewis Vogelsang
Rio Grande Valley

J. THEODORE WOLFE is now president of Baltimore (Md.) Gas & Electric Co. He succeeds CHARLES P. CRANE, formerly chairman of the board and president, who was reelected chairman of the board. AUSTIN E. PENN, formerly vice president, was advanced to executive vice president, Mr. Wolfe's former position. Other newly elected officers are RAYMOND H. ARNDT, vice president; ALFRED P. RAMSEY, vice president and general counsel; and C. EDWIN BRISTOR, assistant vice president.

NORMAN B. BERTOLETTE has been elected chairman of the board of Hartford (Conn.) Gas Co. WILLIAM T. JEBB succeeds him as president. Mr. Jebb, who becomes chief executive officer, has been vice president and general manager of Hartford Gas since January 1954. Mr. Bertolette has been president of the company since 1935 when he resigned the presidency of Harrisburg (Pa.) Gas Co.

LEWIS O. VOGELSANG has been elected president of Rio Grande Valley Gas Co., Brownsville, Texas. Mr. Vogelsang has been vice president and general manager of the company since 1946. ODBERT P. WILSON, who has been president since 1940, is now chairman of the board and principal executive of-

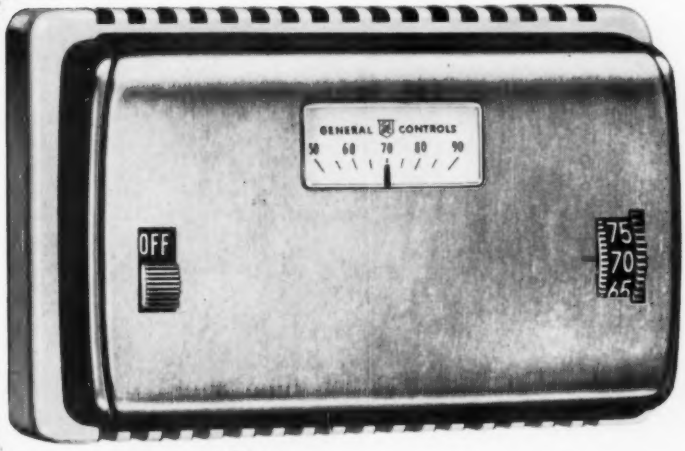
N. B. Bertolette
Hartford Gas

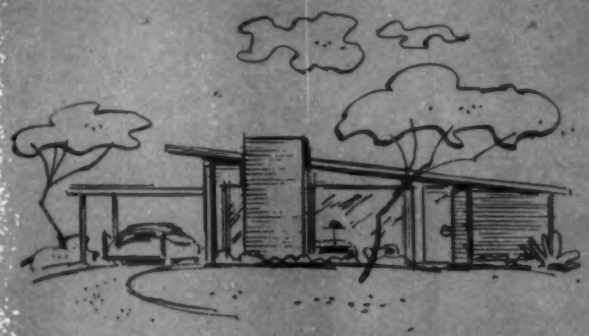
William Jebb
Hartford Gas

THE "WALLMARK" OF QUALITY

Its soft lustrous metal agleam — this exquisite new General Controls thermostat speaks to the homeowner of **quality!** He or she recognizes that here is a precision instrument whose accuracy guarantees uniform heating and/or cooling control for years to come.

THE BEAUTIFUL NEW T-90 THERMOSTAT IS AT HOME ANYWHERE





Whenever you specify or install the General Controls T-90, you create confidence in the homeowner that the entire heating system will perform with maximum efficiency. And **you** know that this mercury switch thermostat is truly a **trouble-free installation!**

Mercury Switch Type Heating Models with Adjustable Heat Anticipation, Cooling Models with Cold Anticipation, and Combination Models.

Your favorite yellow-page-listed wholesaler or local General Controls office will gladly advise you on your requirements.

GENERAL CONTROLS

America's Finest Automatic Controls for Home, Industry, and the Military

Glendale, California · Skokie, Illinois

Five Plants — 40 factory branch offices serving the United States and Canada

C. J. Poppelreiter
Peoples Gas

Raymond Lynch
Chicago District

Clifford Older
Chicago District

John Grindel
Peoples Gas

C. B. Puchalski
Peoples Gas

R. G. Read
Fisher

ficer. ARLEN G. SWIGER is vice chairman of the board and chairman of the executive committee. Other new officers are WARNER H. MEREDITH, vice president, treasurer, and assistant secretray; CLAYTON A. IRWIN, vice president; NEWTON B. SCHOTT, secretary; WILLIAM A. HUTCHISON, assistant vice president, assistant treasurer and assistant secretary; ROBERT T. MCMINN and OSCAR M. KIESWETTER, assistant treasurers.

Five managerial promotions have been announced by the Peoples Gas Light & Coke Co., Chicago. CHRIS J. POPPELREITER is now construction engineer in the engineering department. RAYMOND P. LYNCH, former assistant superintendent, succeeds him as superintendent of Chicago District Pipeline Co., a subsidiary. CLIFFORD D. OLDER goes from supervisory engineer in Peoples Gas' engineering department to assistant superintendent of Chicago District. JOHN F. GRINDEL is now chief draftsman in the engineering department and CLARENCE B. PUCHALSKI was named assistant superintendent at the south station production.

R. G. READ has been named Minneapolis district sales representative for Fisher Governor Co., Marshalltown, Iowa. Mr. Read joined Fisher in 1948. His territory includes Minnesota and North Dakota and parts of Wisconsin and South Dakota.

MARVIN H. GROVE, president of Grove Valve & Regulator Co., and ROBERT G. HESS, executive vice president of Walworth Co., have been elected directors of Walworth.

Three promotions in the Roanoke (Va.) Gas Co. have been announced. GLENN H. TESTERMAN, formerly office manager, is now assistant manager and supervisor of credit. M. DAVID MITCHELL succeeds Mr. Testerman as office manager, and EDWARD C. DUNBAR is now comptroller, a newly created position. Mr. Mitchell's former position was that of administrative assistant and Mr. Dunbar was senior accountant.

New directors of Central Illinois Light Co., Peoria, are GEORGE W.

LETTER
11-AM
7 JAN 8
FROM ABROAD
Re: Fritz Schneller
Schnitzlebank Heater Co.
Dear Boss,
Meinself is helpen der Fritz
mit der beer garden heaten business.
Ist pipen der beer mit der Maxitrol
regulators. Ist needen ein gross.
Auf Wieder sehen,
Maxine
LOWER MANIFOLD COSTS
WITH "STRAIGHT-THRU-FLOW"
Although "Der Beer Pipen" is not recommended, gas heating manifold construction costs can be substantially reduced with "Straight-Thru-Flow." Conical valve design permits the gas to flow "Straight-Thru" the regulator without changing direction, thus reducing pressure drop.
More freedom in manifold design as well as substantial savings are your result. For example: you can use smaller diameter pipe, smaller and less expensive manifold components . . . and save space.
Write Maxine for these and other design advantages of "Straight-Thru-Flow."
Distributed in Canada by Honeywell Controls, Limited
MAXITROL COMPANY
12200 BEECH RD.
DETROIT 39, MICH.

HATHWAY, who is also executive vice president, and ROBERT J. SANER, who is vice president of the Springfield (Ill.) Marine Bank.

ERSKINE E. TRAYNHAM has joined John Wood Co. as sales representative for the company's heater and tank division in southern Virginia, North Carolina, South Carolina, and east Tennessee. He will headquarter in Greenville, S. C.

Robertshaw-Fulton Controls Co. has appointed RALPH J. DAVIDSON as sales representative for the heating controls division. He will serve the Pacific Southwest area from offices in Long Beach, Calif.

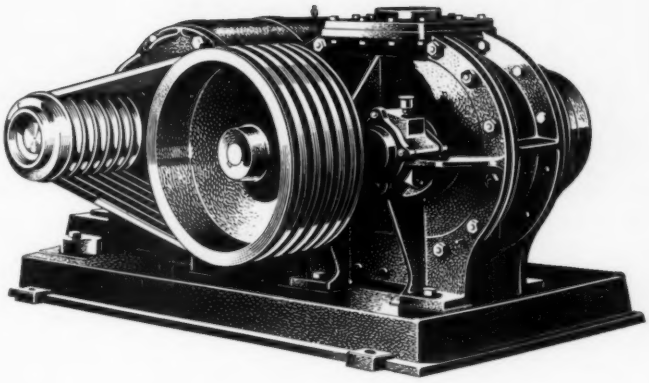
A. LYNDON FOSCUE, BIRNY MASON JR., and EDWIN B. SUYDAM are new vice presidents and members of the appropriations committee of Union Carbide & Carbon Corp., New York.

Stone & Webster Service Corp., New York, has elected FRANK B. MUHLFELD a vice president.

The Parsons Co., Newton, Iowa, has appointed four district sales representatives. They are: EUGENE H. NELSON, covering Connecticut, Delaware, Maine, Maryland, Massachusetts, lower Michigan, New Hampshire, New Jersey, New York, North Carolina, Ohio, Penn-Virginia and West Virginia. ROBERT J. ARBS, who will cover Alabama, Arkansas, Florida Georgia, Louisiana, Mississippi, Oklahoma, Tennessee, and eastern Texas. RUSSELL J. DYE, who will cover Arizona, California, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, western Texas, Washington, and Wyoming. JOHN J. HARVEY, who will cover Illinois, Indiana, Iowa, Kansas, Kentucky, upper Michigan, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota.

FRANCIS MONTELIONE, assistant comptroller of Brooklyn (N. Y.) Union Gas Co., and GERARD J. KINLEN, treasurer of Inland Natural Gas Co., Ltd., Vancouver, B.C., have been elected to membership in the Controllers Institute of America.

LOUIS C. BALDACCI, JR., has been promoted to supervisory engineer in the meter shop of Peoples Gas Light & Coke Co.



R-C gas pumps eliminate friction and leakage problems

One of the many operating advantages of Roots-Connersville rotary positive displacement gas pumps are the exceedingly small losses due to leakage and friction. This high efficiency is assured by the inherent design of the pump in which the impellers operate without internal contact. Yet so accurately gauged are the clearances that slippage is reduced to an absolute minimum. Maximum power savings are realized since horsepower required is determined by operating pressure.

From 5 to 50,000 cfm, these pumps assure positive control of both volume and pressure. Design simplicity further assures long term peak performance with little down-time and maintenance held to a minimum.

Available in 76 capacities and sizes, R-C rotary gas pumps can be exactly matched to your requirements. For engineering data, write for Bulletin 32-33-B-13 or Bulletin 31-B-17 on small pumps.

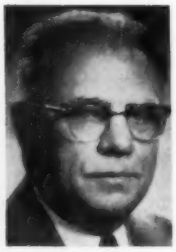
Engineers—unusual career opportunities await you at Roots-Connersville. Address your resume to Professional Employment Manager.

ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC.

657 Oregon Ave., Connersville, Indiana. In Canada—629 Adelaide St., W., Toronto, Ont.

William Boyd
N. Y. State



William Peters
J. I. Case

L. P. Jones
United Gas

Edward Patterson
SoCounties

Robert McIntyre
SoCounties

William Bullock
SoCounties

WILLIAM A. BOYD has been appointed head of the general accounting department of New York State Natural Gas Corp., Pittsburgh.

WILLIAM B. PETERS has been elected vice president and treasurer of the J. I. Case Co., Racine, Wis. Mr. Peters has been with the Case organization since 1912. The company has also named JOHN D. GRAYSON to the post of controller. He was formerly vice president and treasurer of American Tractor Corp., which recently merged with Case.

L. P. JONES is now sales manager of the Houston (Texas) division of United Gas. Mr. Jones has been a sales supervisor in the Texas administrative office of the company. He succeeds W. M. STEPHENS, who is being transferred to the United Gas organization in Jackson, Miss.

Southern Counties Gas Co., Los Angeles, has named WILLIAM C. BULLOCK to succeed retiring J. C. GILBERT as manager of the Santa Monica Bay division. EDWARD B. PATTERSON succeeds Mr. Bullock as Harbor division manager. Succeeding Mr. Patterson as sales manager in the Orange county division is ROBERT M. MCINTYRE, who most recently has been responsible for market development and research in the company's general office.

American Liquid Gas Corp., Los Angeles, has appointed DON MACK to the post of advertising manager.

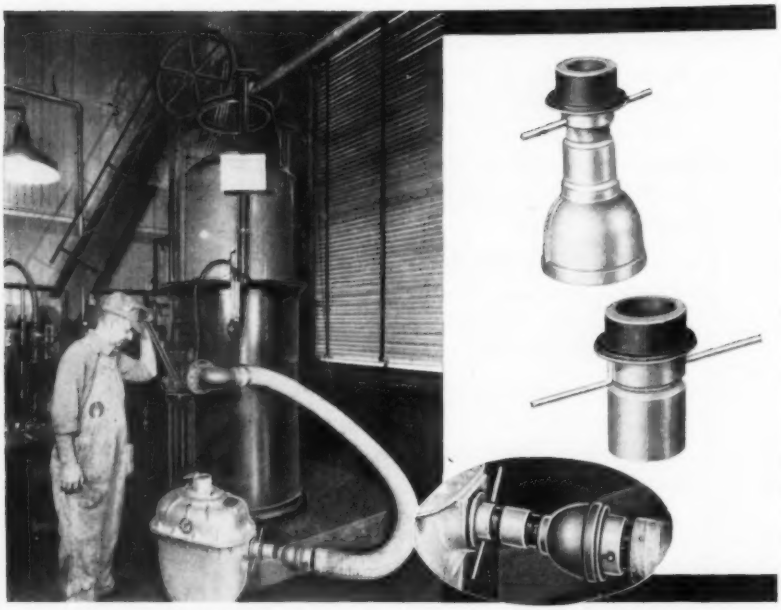
Lone Star Gas Co., Dallas, has named WALTER J. ROBERGE manager of the purchasing department and A. L. WILLIAMS manager of the stores department. Mr. Roberge succeeds W. G. NASH, who has retired, and Mr. Williams succeeds E. L. HARPOLD, who also retired.

RAY D. MACMAHON, former general staff supervisor of industrial and commercial sales for the Southern California Gas Co., Los Angeles, has been named sales manager of the steam generator division of the Clayton Manufacturing Co., El Monte, Calif.

HERMAN GOTTWALD and DONALD C. M. MORGAN have been named assistant vice presidents and product

Turn-Tite Trade-Mark Adjustable Quick Connectors for Gas Meters

SAVE TIME... SAVE MONEY



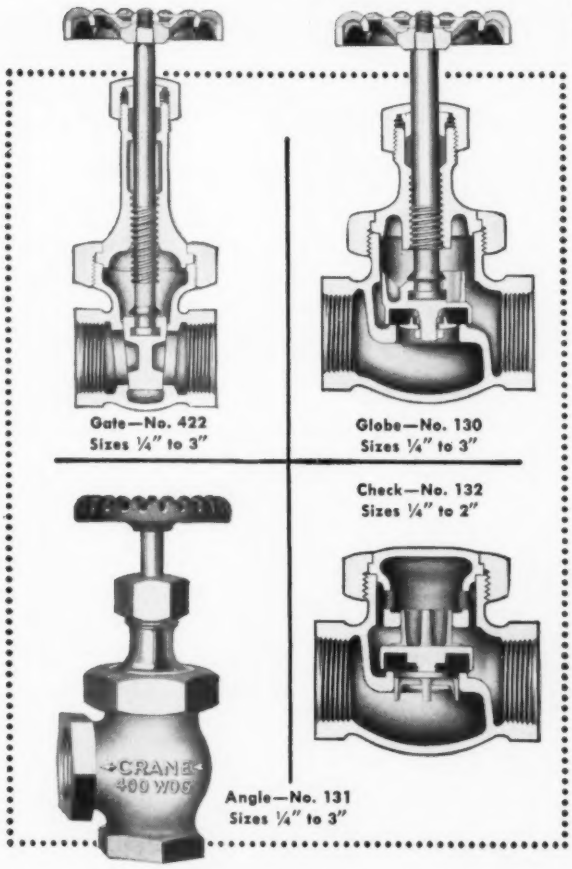
Turn-Tite Adjustable Quick Connectors are made in 3 sizes for 2", 3", or 4" openings. 2" and 3" connectors are available with or without a bell housing permitting single or combination installations. Turning the handle clockwise expands the rubber bushing, making a positive leak-proof seal.

Write today for literature and prices.

MOELLER MFG. CO., INC., Racine, Wisconsin

Be Sure!...

with CRANE Bronze Valves for your LP-Gas Services



You can be sure of *safer* installations on storage tanks, piping, tank trucks and customers' premises when you use Crane Bronze LP-Gas Valves.

Crane Bronze Valves are built to stay tight even under severest service conditions. Globe, angle and check patterns are fitted with Crane No. 6 long-wearing composition discs, which are *cemented* into place for double insurance against internal leakage. Gate patterns have a fully guided wedge disc; it seats tight, resists seating surface wear.

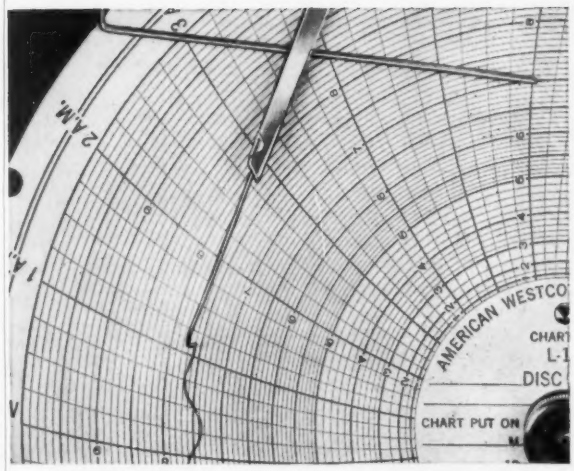
Standardize on Crane Bronze Valves. Your installations will be safer—your customers more confident. These U/L approved valves are available at your local Crane outlet.

For complete details, see your local Crane representative, or write to the address below.

CRANE VALVES & FITTINGS

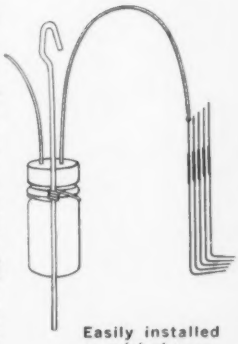
PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill.
Branches and Wholesalers Serving All Areas



CANNON PENS

assure legible charts ...eliminate inking problems



Cannon controlled-flow capillary meter pens provide exceptional dependability and long life with minimum maintenance. Easy to install, these precision pens produce accurate chart records of maximum legibility and continuously record up to a full year without refilling reservoir.

Easily installed as original or replacement equipment in all standard recording instruments. Available in five sizes and angles—special pens upon request.

- **Ends Unrecorded Intervals.** Unaffected by pulsating flows, chart speeds, rapid pen movement.
- **Sealed Ink Supply.** Prevents clogging from atmospheric contamination.
- **Two-Way Ink Flow.** Stainless steel writing point is positioned above ink level in reservoir and ink flows in either direction by capillary action—eliminates smearing, blurring.
- **Special Pens.** Designed and produced to customer specifications where special inking problems make standard pens impractical.

Write today for information

AMERICAN METER COMPANY
INCORPORATED (ESTABLISHED 1836)

GENERAL SALES OFFICE: Philadelphia 16, Penna. • Albany • Alhambra • Atlanta • Baltimore • Birmingham • Boston • Chicago • Dallas • Denver • Erie • Houston • Kansas City • Los Angeles • Minneapolis • New York • Omaha • Pittsburgh • San Francisco • Seattle • Tulsa • Wynnewood, IN CANADA: Canadian Meter Company, Ltd., Milton, Ontario • Calgary • Edmonton • Regina

SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters Instruments • Reliance Regulators • Apparatus • Valves

Charles Parkin
Barber-Greene

W. E. Putz
Barber-Greene

H. Gottwald
Rockwell

Donald Morgan
Rockwell

George Varga
Roots-Connersville

R. F. Crawford
Foster Co.

managers of Rockwell Manufacturing Co.'s meter and valve division. Mr. Gottwald's duties will be in valve sales and Mr. Morgan's will be in gas products sales. ROBERT A. JOHNSON, New York district sales manager, succeeds Mr. Gottwald as eastern sales manager. THOMAS O. CARSON, Pittsburgh district manager, succeeds Mr. Morgan as central regional sales manager.

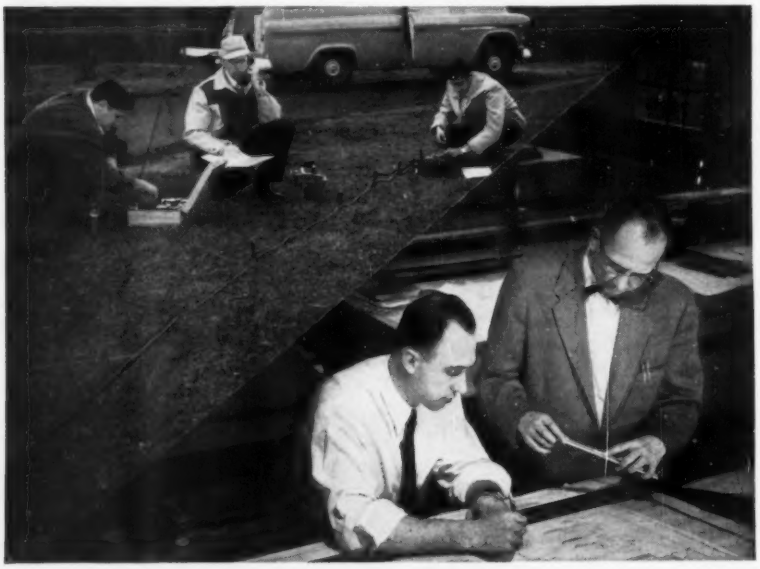
W. E. PUTZ has been promoted to the post of administrative assistant to E. H. Holt, vice president and director of sales of Barber-Greene Co., Aurora, Ill. CHARLES E. PARKIN, formerly technical editor in the advertising department, succeeds Mr. Putz as advertising manager of the company.

ROBERT F. CRAWFORD has joined the Pittsburgh office of L. B. Foster Co. as a specialist in pipe sales.

Roots-Connersville Blower, division of Dresser Industries, Inc., has established a Boston district sales office. GEORGE F. VARGA heads the new office. He will assume responsibility for the organization and management of the Boston sales territory, which includes Massachusetts, Rhode Island, Vermont, New Hampshire and Maine. With more than 15 years' experience selling engineered equipment, Mr. Varga has spent the last five years as a field engineer in Roots-Connersville New York district office.

WESLEY P. PATNODE has succeeded ANSON L. BERRYMAN as president of Fall River (Mass.) Gas Co. Mr. Berryman has retired after 29 years of service with the company. He was treasurer for five years, vice president for 22, and president and member of the board of directors for the last two years.

VOLNEY H. KYLE, JR., has been named vice president and general manager of North Carolina Natural Gas Corp. He will headquarter at the regional offices of the company in Fayetteville, N. C. Mr. Kyle will direct construction of the N. C. Natural plan to bring gas



E. R. P. CATHODIC PROTECTION . . .
individually designed for each application

An effective installation that operates at the lowest cost per year requires experienced engineering evaluation of site and environmental conditions. The Electro Rust-Proofing Engineering Division makes available to you the cumulative experience gained in designing more than 10,000 cathodic protection systems.

Electro Rust-Proofing can furnish any one, or all, of the following services to help you provide proper cathodic protection for each of your jobs:

- Corrosion surveys and recommendations
- Design based on engineering experience
- Cathodic protection equipment and installation
- Service to assure proper operating results

For additional information write today.

ERP CATHODIC PROTECTION SINCE 1935

ELECTRO RUST-PROOFING CORP.
A SUBSIDIARY OF WALLACE & TIERNAN INC.
30 MAIN STREET, BELLEVILLE 9, NEW JERSEY
CABLE: ELECTRO, NEWARK, N. J.

E-35R

into 29 communities by early next year.

Bucyrus-Erie Co., South Milwaukee, Wis., has appointed HENRY M. JAMESON as general manager of its drill division with headquarters in Richmond, Ind.

MRS. SHIRLEY PEMBERTON, a member of the home economics department of Robertshaw - Fulton Controls Co., has been placed in charge of that department's activities.

D. I. OVERLAND has been appointed engineer in charge of the recently formed gas department of Ralph D. Thomas & Associates Inc., engineers, Minneapolis.

Deaths

JOHN R. LEGGATE, manager of customer service of Equitable Gas Co., died recently at his home in Glenshaw, Pa. Mr. Leggate, a 32-year veteran with Equitable, joined the company as a clerk in the retail service department. He was promoted to supervisor of the north side office of the retail service department in 1929.

HOWARD F. MOORE, 58, a vice president of the Iroquois Gas Corp., Buffalo, N. Y., died recently. Mr. Moore was a vice president of the Republic Light, Heat & Power Co. before being named a vice president of Iroquois last December.

VERNON F. PALMER, vice president in charge of operations for Union Gas System, died recently in Independence, Kan. Mr. Palmer was a pioneer in the gas business in southeast Kansas having started with Union in 1915.

BERT HOLLINGSWORTH WINHAM, 53, secretary of United Gas Corp., died recently in Shreveport. Mr. Winham had been associated with United Gas for 26 years. He first joined the company in 1930 as secretary to N. C. McGowen, then head of the operating subsidiaries. He was named assistant secretary of United Gas Pipe Line and Union Producing in 1937, and became assistant to the president of the companies in 1947. In October 1951 he was elected secretary of United Gas Corp. and secretary and assistant treasurer of the pipeline and producing companies.

digs more trenches in more places at less cost—and

fits more jobs!

THIS CLEVELAND 92—a compact maneuverable "Baby Digger"—is doing a neat job of digging from driveway to driveway in a tree lawn that's really *narrow*. The operator sets in and lifts out the digging wheel with speed and safety because the 92 gives him full job visibility and fast accurate boom hoist control. Synchronized wheel and conveyor speeds permit precision placement of spoil. No damage to curb, sidewalk or driveways either, thanks to the 92's perfect balance on long, smooth, non-clog crawlers —a real public relations asset.

The Cleveland 92 "Baby Digger"

- Digs all soils
- Digs in any weather
- Only 54" wide over crawlers
- Digs 10" to 20" wide
- Digs to 5' deep
- Power-shift conveyor
- Reversible discharge
- Portable, at legal limit speeds

THE CLEVELAND TRENCHER CO.

20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

Good Everywhere

Safety *Cont'd from page 51*

A supervisor has the further obligation, in the interests of safety, to face squarely the problem of the employee who is accident-prone or "thumb-handed." If the situation clearly constitutes a hazard to the man himself or to those around him, it is essential that he be moved to other work or removed from the job. This is not a pleasant task, and many people shun any action which may deprive a man of his job. However, supervisors have an obligation to protect other employees from the careless or clumsy acts of an associate, and even to protect the awkward employee from himself.

The necessity for acceptance of responsibility for safety by line supervision does not stop with the front-line supervisor. It extends on up the line to higher levels of supervision. While it will be generally agreed that a superintendent should not step in and run a foreman's job, it does not follow that the superintendent has no responsibility for the work performed by his foreman's crew or for the safety of the personnel. I have little patience with the superintendent who finds convenient reasons for being elsewhere when a particularly hazardous job is to be done. Generally, the underlying motivation for such absence is to make it possible to shift responsibility if anything goes wrong.

Certainly the foreman is expected to do the job, without undue interference or second-guessing by others. But the superintendent is responsible for the choice of the man to direct the job and for backing him up with any advice or reinforcements needed; and is accountable in turn to higher management for job failures. The situation has a rough parallel in military organization. The company commander is given an objective to accomplish and is expected to achieve it, but the battalion commander stands ready to back up his actions to the extent necessary, and to throw in any reinforcements as needed.

In summary, these are the things I believe that management expects of a safety program:

The achievement of a bona fide reduction in accidents at a reasonable program cost.

Reliability of accident statistics, a real improvement and not just a paper profit.

Cost consciousness on the part of both safety staff and line supervision, with a critical appraisal as to the real value of various elements of the program.

A clear-cut understanding of the working relationships which should exist between safety staff and line supervision, and a definition of their respective areas of responsibility.

A competence in line supervision and a quick willingness on their part to assume their share in executing the safety program.

Finally, it should be the doctrine of all concerned to guide employees through their working careers so well that they reach retirement age without having sustained a serious or crippling injury. ■

This article is adapted from a talk presented at the PCGA accident prevention conference, Feb. 28 in Santa Barbara, Calif.

Here's Briggmann

..CARBIDE'S CARBOSEAL Anti-Leak man, with the answer to leakage due to dried-out fiber packing in bell-and-spigot joints.

Many gas companies have learned from George Briggmann that *CARBOSEAL Anti-Leak is:*

- effective
- inexpensive
- lasting
- easy and economical to apply

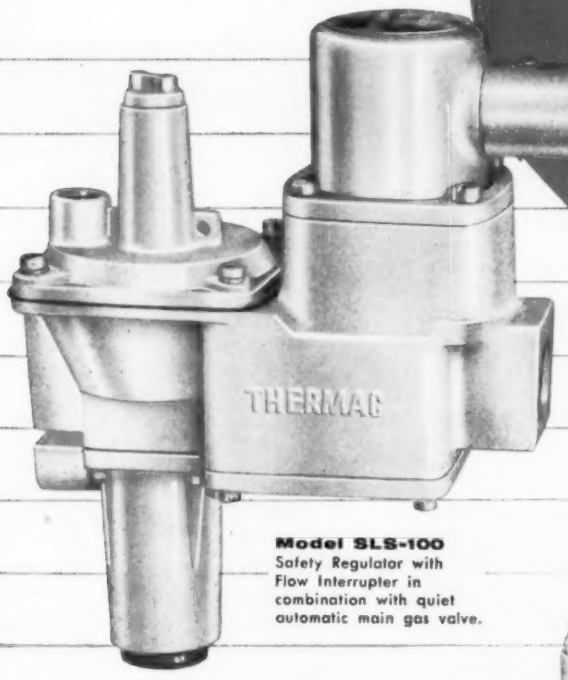
Let George give *you* the details. Write for Booklet 4506, or better still, the 16 mm. color-sound movie, "CARBOSEAL Anti-Leak Stops Gas-Main Leakage." You'll profit by it.

CARBOSEAL ANTI-LEAK

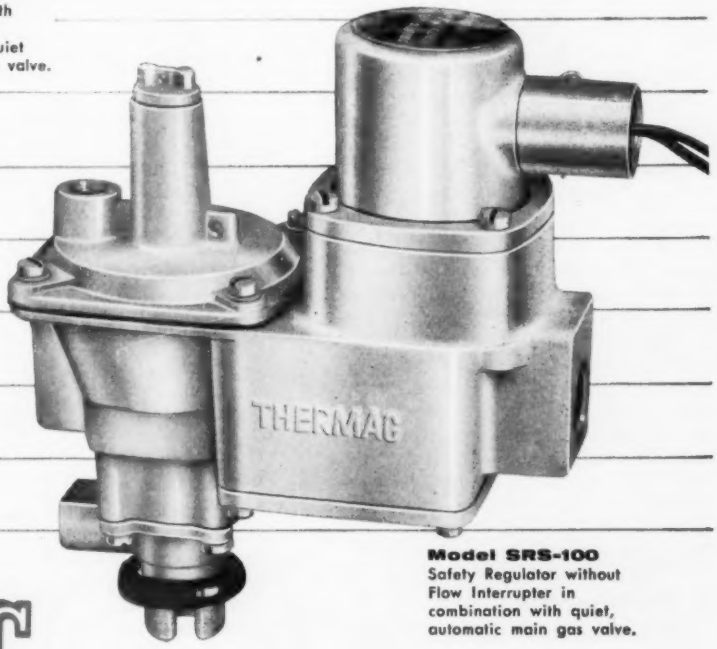
Carbide and Carbon Chemicals Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
In Canada:
Union Carbide Canada Limited, Toronto

"Carboseal" is a registered trade-mark of Union Carbide and Carbon Corporation.

New!
THERMAC
all-in-one
GAS APPLIANCE CONTROLS



Model SLS-100
Safety Regulator with Flow Interrupter in combination with quiet automatic main gas valve.



Model SRS-100
Safety Regulator without Flow Interrupter in combination with quiet, automatic main gas valve.

Certified by A.G.A.

THERMAC
HM COMPANY

800 E. 108th Street, Los Angeles 59, California
Over 24 years' experience building gas controls

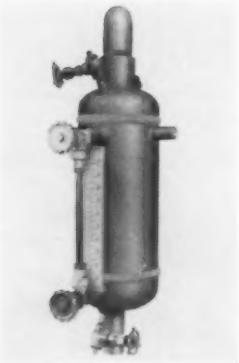
Send for specifications, dimensions and prices.

Gas Digest

A digest of what's new in products and trade literature compiled by the editors of GAS as a reader service.

New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 87, 88



1. Odorizers

New H&H odorizers from Tod Pazdral Pipeline Specialties include the bypass-wick type shown here. Also included in the line is a larger unit of the combination drip and absorption type.

The units are custom-built to provide adequate service for each specific installation. H&H odorizers have no moving parts and, according to the company, require no maintenance. Models are available for large city distribution systems, compressor stations and small field camps.

Tod Pazdral Pipeline Specialties

2. Control system

More than 1000 different codes can be transmitted over a single-two-way channel with a new supervisory control system.

Introduced by Hupp Electronics Co., the new system will control and continuously supervise hundreds of functions at remote locations. It is particularly suited for control of pipelines, power stations, and similar applications.

The ERX (electronic remote switching) unit operates on any communication facility acceptable to standard teletype transmission. It does not respond to signals of the communication traffic. Directions can be given simultaneously for transmission over a single-two-way channel and they will be performed sequentially.

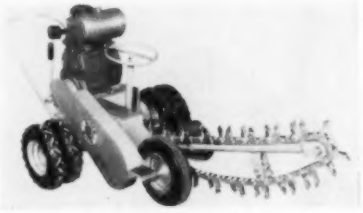
Hupp Electronics Co.

3. Push-button thermostat

What is believed to be the first push-button room thermostat has been introduced by White-Rodgers.

The new heating-cooling thermostat is a combination of a new push-button sub-base and White-Rodgers Fashion thermostat. Available in combinations to fit most heating-cooling systems, the new control offers from two to five actual push-buttons. It is designed with both adjustable anticipation to match the primary heating control, and built-in "cooling-anticipation."

White-Rodgers Co.

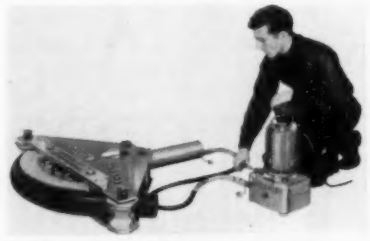


4. Line trencher

A new utility Ditch-Witch service line trencher for utilities, contractors, and municipalities has been introduced by Charles Machine Works Inc.

The new Model M is completely mobile with three forward digging speeds and reverse plus road speeds up to 5 mph. In usual digging conditions, the Model M will trench at speeds of 1½ to 6 ft per minute. It is also equipped with a trailer hitch for towing at speeds up to 25 mph. Trenching widths are 3 in. wide up to 48 in. deep, 4 in. wide up to 36 in. deep, and 6 in. wide up to 30 in. deep.

Charles Machine Works

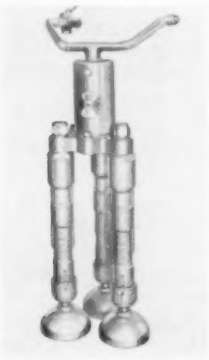


5. Power bender

With a new lightweight hydraulic bender, only one ram stroke is needed to make a full 90° bend in 4-in. and smaller pipe.

According to Greenlee Tool Co., the use of high strength aluminum alloy makes this 40-ton bender light enough for one man to carry the heaviest section with ease. Specially designed pipe supports serve as rollers when wheeling bender from one location to another. The bender can be used in any position without loss of operating efficiency.

Greenlee Tool Co.



6. Triple tamper

Le Roi's new triple tamper has a built-in line oiler to assure positive oil feed while the tamper is in operation. The new tamper, OT11, has a handle grip throttle valve with a safety snap action which shuts off the air supply when the lever is released. A plug-type throttle is available as optional equipment.

The three tamper butts cover a 70-sq in. area, compacting the same amount of backfill as five single tampers. It is ideal for narrow trench, close foundation, or abutment tamping.

Le Roi Division

7. Radiotelephone system

Du Mont's completely automatic two-way radiotelephone system allows phone calls to-and-from vehicles to be relayed, completely unattended, through local telephone systems.

Calls are made from a vehicle by simply dialing a number within a local telephone system. Also, anyone within that system can call the vehicle in the same manner as when making a house-to-house call. The mobile system operates on a 24-hr basis and no manual operators are required.

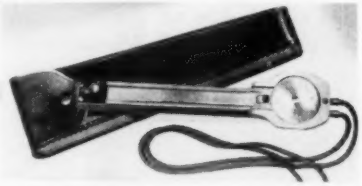
Allen B. Du Mont Laboratories

8. Furnaces

With the accent on special design for the needs of air conditioning, Day & Night Manufacturing Co. has introduced a line of air conditioning, gas-fired forced air furnaces. All units feature increased air delivery capacities especially matched to the needs of modern refrigerated air conditioning systems.

The units are available in either the Master or Lifeguard line. The ceramic coated heating element, for use where condensation is a problem, is used in the Lifeguard line only.

Day & Night Manufacturing Co.



9. Range finder

Edmund Scientific Co. has available a 6-in. field Range Finder which will measure distances from 8 to 100 ft, especially distances to inaccessible objects and places.

Operation of the Range Finder is based on coincidence of two images: one image is seen in its natual color and the other in a strongly contrasted gold color. Upon sighting through the eyepiece, both images will be seen. Accuracy is assured within 2 per cent.

The Range Finder, which has a 6-in. base, is supplied in a leather carrying case.

Edmund Scientific Co.

10. Trenching machine

A big capacity trenchliner, the Parsons 170, has been added to its line of wheel-type trenching machines by the Parsons Co.

A new feature of the 170 is a hydraulically driven conveyor that provides belt speeds up to 600 ft/minute, yet works completely independent of the wheel speeds. As a result it is possible to place spoil at a convenient distance from the trench wall when wheel speeds are slowed due to tough digging conditions. The 170 will produce from 12 in. to 25 ft of trench per minute in a range of 30 digging speeds. Maximum digging depth is 5 ft.

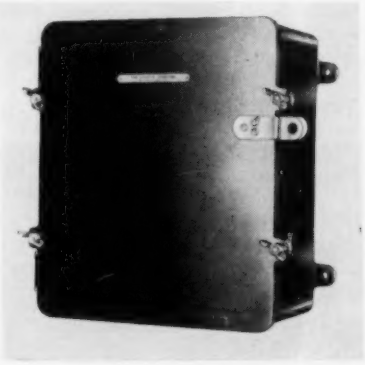
Parsons Co.

11. Magnetic tape truck

Storage for magnetic tape used in electronic computers is provided in a new mobile magnetic tape truck. Remington Rand's tape truck does triple duty: It houses, protects, and transports tape. The unit is light enough so that a girl can easily remove it from vault to point-of-use.

The truck has a removable recessed accessory tray with two compartments at one end. The opposite end has a convenient handle and label holder for proper identification. Each bin also has its individual label holder.

Remington Rand



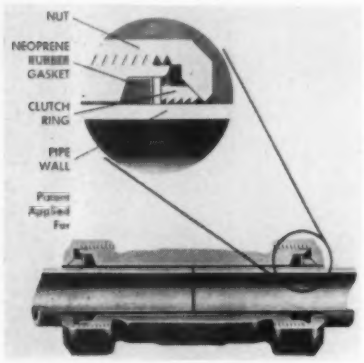
12. Weatherproof gauges

Recording gauges for pressure, vacuum, and water or liquid level measurements are available from Bristol in new weatherproof cases.

The new gauges are designed for wall or pole mounting outdoors, where they will be subjected to all

types of weather. Measurements of water depths or other liquids can be accomplished with float-type, pressure-type, differential pressure, or bubbler type liquid level gauges. Pressure gauges are offered in all ranges.

Bristol Co.



13. Threadless pipe fitting

Traction forces up to 3600 lb will be withstood by new threadless pipe fittings developed by Telsco Fittings Division. The fittings will withstand hydrostatic pressures ranging from 450 psi on 2-in. pipe to 5000 psi on ½-in. pipe.

Factory assembled, the fittings are ready for use in joining steel, wrought iron, or plastic pipe. No threading, grooving, flaring, soldering or welding necessary. A specially designed brass clutch ring has internal serrations that grip the pipe wall as the fitting nut is tightened. Socket ends and nuts are reamed slightly oversized to accommodate out-of-round and off-tolerance pipe ends.

Telsco Fittings Division

14. Accounting machine

Burroughs has introduced a new office machine which combines an 84-character, full-keyboard electric typewriter with a high-speed, accumulating register accounting machine.

The new machine, the Typing Sensimatic, was designed to meet increasing demands for flexibility in the handling of office paperwork, particularly in the posting and accounting areas.

The Typing Sensimatic will be available in 10 models. Its overall size is only slightly larger than the conventional Sensimatic accounting machine.

Burroughs Division

15. Unit heater

A compact 25,000-Btu unit heater, Model 25 UF, has been added to Utility Appliance Corp.'s line of heating equipment.

Designed for complete versatility, the new heater is only 16¾ in. high, 10 5/18 in. wide, and 21 in. deep. It is a space saver that provides maximum headroom in restricted areas. The heater is encased in a modern-design cabinet that is die-formed in grey hammertone enamel. The unit suspends from pipe hangers, for quick and easy installation. Maintenance is simplified by the hinged bottom pan and lighter door on the side.

Utility Appliance Corp.

16. Test station

Mulcare Engineering Co. has introduced its waterproof underground cathodic protection test station.

According to the company, the No. 20 test box will insure cathodic protection and, with its lightning arrestors, will function when completely submerged. It is made of a special neoprene compound with excellent dielectric strength. Test wires are readily accessible and all connections are easily made without splicing or taping.

Illustrated is the test box for the No. 20 test station. It consists of a 5-in. cast iron lid and collar and 18 in. of non-conductor Orangeburg fiber pipe. The lid is flush with the surface grade.

Mulcare Engineering Co.

TRADE LITERATURE

17. Industrial radio

A new four-page bulletin from Industrial Radio Corp. describes the hand-carried Pak-Fone, portable two-way radio. The Pak-Fone is designed for communication as a packet (using internal batteries), as emergency mobile equipment (using 6-volt vibrator supply), as an emergency station (using 117-volt ac supply), and as a standby unit (using internal battery supply).

Industrial Radio Corp.

18. Data processing system

Philco Corp.'s Transac electronic data processing system is the subject of a new bulletin. The fully illustrated bulletin discusses the Transac S-2000—a transistor computer designed to provide simple and economic data processing and evaluation. The S-2000 is a compact unit—a complete 48-digit unit in less space than a small office.

Philco Corp.

19. Valve bulletin

A new 16-page illustrated bulletin from Walworth Co. describes polyvinyl chloride valves and fittings. Application tables cover performance or normal impact PVC and high impact PVC valves and fittings. Additional tables cover physical properties, recommended working pressures, and effect of temperature on working pressure.

Walworth Co.

20. Valve catalog

Honeywell's V-80 gas valve is the subject of a new bulletin. Mechanical parts of the valve are sealed from dirt and corrosion and have lifelong lubrication. All operating parts are out of the gas stream, and the valve has self-cleaning, self-aligning seat.

Minneapolis-Honeywell

21. Combination burners

Mettler's "Fan-Air" combination gas-oil burners are described and illustrated in a revised bulletin (GO-200-B). The burners are for use on jobs requiring dual fuels of industrial or commercial capacity up to 800 bhp.

Mettler Co. Inc.

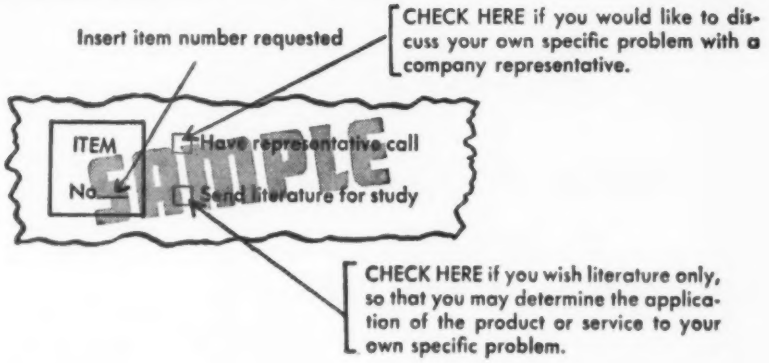
22. Regulator bulletin

A comprehensive brochure on gas regulators for house or service

FOR MORE INFORMATION...
on New Products and Trade Literature

...use these SPECIALIZED READER SERVICE CARDS

They are designed to SAVE TIME and give you BETTER SERVICE on your inquiries.


Insert item number requested
CHECK HERE if you would like to discuss your own specific problem with a company representative.
ITEM No.
SAMPLE
Have representative call
Send literature for study
CHECK HERE if you wish literature only, so that you may determine the application of the product or service to your own specific problem.

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 6955, Sec. 34.9 P. L. & R., Los Angeles, California

GAS **magazine**
READER SERVICE DEPT.
198 SOUTH ALVARADO ST.
LOS ANGELES 57, CALIF.

Please send me further information on GAS DIGEST items listed below.

ITEM No.___ ☐ Have representative call ☐ Send literature for study	ITEM No.___ ☐ Have representative call ☐ Send literature for study
ITEM No.___ ☐ Have representative call ☐ Send literature for study	ITEM No.___ ☐ Have representative call ☐ Send literature for study
ITEM No.___ ☐ Have representative call ☐ Send literature for study	ITEM No.___ ☐ Have representative call ☐ Send literature for study

Please print.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

June, 1957 **Void after 90 days**

Important!

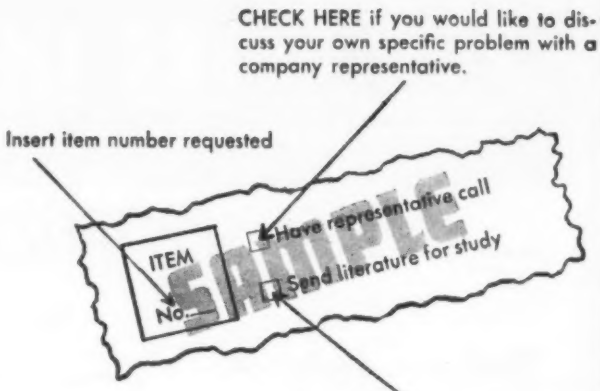
Note how these Reader Service Cards are *Specialized* so that you may . . .

☑ Request a company representative to call to discuss your own specific problem, or . . .

☑ Request data only, to study the application of the product or service to your own specific needs before talking with a company representative.

Keep up with what's new in Products and Services

Make use of GAS Magazine's Specialized Reader Service Cards


CHECK HERE if you would like to discuss your own specific problem with a company representative.
Insert item number requested
ITEM No.
Have representative call
Send literature for study
SAMPLE
CHECK HERE if you wish literature only so that you may determine the application of the product or service to you own specific problem.

Please send me further information on GAS DIGEST items listed below.

ITEM No.___ ☐ Have representative call ☐ Send literature for study	ITEM No.___ ☐ Have representative call ☐ Send literature for study
ITEM No.___ ☐ Have representative call ☐ Send literature for study	ITEM No.___ ☐ Have representative call ☐ Send literature for study
ITEM No.___ ☐ Have representative call ☐ Send literature for study	ITEM No.___ ☐ Have representative call ☐ Send literature for study

Please print.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

June, 1957 **Void after 90 days**

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 6955, Sec. 34.9 P. L. & R., Los Angeles, California

GAS **magazine**

READER SERVICE DEPT.

198 SOUTH ALVARADO ST.

LOS ANGELES 57, CALIF.

Important!

Note how these Reader Service Cards are *Specialized* so that you may . . .

☑ Request a company representative to call to discuss your own specific problem or . . .

☑ Request data only to study the application of the product or service to your own specific needs before talking with a company representative.

installation has been published by American Meter Co. Bulletin 100 describes the Reliance Series 1400 and 1500 regulators. Included is information on construction, capacities, dimensions, standard modifications and replacement parts.
American Meter Co.

23. Valve regulator bulletin

Rockwell's low-pressure balanced valve regulators are described in a 12-page, photo-illustrated revision of bulletin 1082, Rev. 2. Presented is a detailed schematic showing use of the Rockwell 173 high pressure regulator for pilot-loading of the "014." A similar drawing shows use of the Type 39 power pilot regulator for the same purpose.
Rockwell Manufacturing Co.

24. Backhoe-loader

J. I. Case Co.'s new 320 industrial backhoe-loader is discussed in a new bulletin. The heavy-duty earthmoving outfit is complete with backhoe, loader, power steering and shuttle transmission. It features a hydraulic foot-controlled 180° swing and a wide ½-cu yd loader-bucket.
J. I. Case Co.

25. Valve catalog

"Valve Performance Facts" presents 32 case histories on the use of Crane 33XL valves. The 33XL is a cast steel gate valve with body seat rings, liners and flange faces of 18-8 SMo alloy, integrally welded.
Crane Co.

26. Bushings and insulators

The latest engineering designs in bushings and insulators for pipeline crossings and plant applications are described in a catalog from T. D. Williamson Inc. Schematic drawings, photographs, specification tables, and cutaway views are used throughout the publication.
T. D. Williamson Inc.

27. School bulletin

Robertshaw-Grayson's traveling service schools are the subject of an eight-page bulletin. The school offers practical classes of instruction on the operation and servicing of gas appliance controls. Meetings are scheduled in cooperation with, and for, master plumbers and their apprentices, utility servicemen, distributor-dealer groups, and other interested organizations.
Robertshaw-Fulton Controls Co.

28. Galvanic protection

Two new reference manuals describe the use and application of zinc as a galvanic anode to protect iron and steel from corrosion. American Zinc Institute is the publisher. "Zinc as a Galvanic Anode Underwater" is a 16-page publication describing the way zinc anodes protect marine craft, water storage tanks, etc., against corrosion. "Zinc as a Galvanic Anode Underground" is a 40-page illustrated book. It discusses the theory and practice of zinc anode application in transmission pipelines, gas distribution systems, etc.
American Zinc Institute

29. Venting catalog

A complete line of vent pipe and fittings for gas-burning devices is the subject of a new catalog issued by Dura-Vent. Detailed data are presented on double-wall, air-insulated vent pipe in both 4-in. oval and in all standard sizes of round pipe, including all the necessary fittings. Included is a chart for quick selection of vent pipe for any installation.
Dura-Vent Corp.

30. Purifier bulletin

Principal applications of Anderson purifiers are (1) prevention of mist carry-over from process vessels; (2) removal of compressor oil, condensate, etc., from steam, air and gas vapor; (3) separation of solids and liquids from natural gas; and (4) elimination of condensate, oil, etc., from steam systems. These applications are discussed in detail in the eight-page, illustrated 1957 catalog.
V. D. Anderson Co.

31. Control valves

Two new specifications (S810-11 and S810-12) give details of construction on single-seated and double-seated Honeywell Series 800 diaphragm control valves. Included are sizes, materials, plus characteristic curves, dimensions and a cross-section drawing of each type.
Minneapolis-Honeywell

32. Control catalogs

Seven electromagnetic control catalogs have been published by Automatic Switch Co. Catalog 57-S is the complete electromagnetic control catalog combining information contained in the six other catalogs. The six individual catalogs discuss automatic transfer switches, remote control switches, magnetically held contactors, relays, solenoids, and electric plant controls.
Automatic Switch Co.

33. Fire detectors

A four-page illustrated brochure on unit fire detectors has been published by Fenwal Inc. The detectors described are the hermetically sealed, Detect-A-Fire units, which operate on a rate - compensation principle, which causes the detector to actuate at its selected protection level regardless of how slowly or rapidly the surrounding temperature rises.
Fenwal Inc.

34. Transmission equipment

Lynch B700 multi-channel code transmission equipment is discussed in a new bulletin. The unit is designed for transmission of varying electrical pulses. It can be used for telemetering systems, supervisory control apparatus, and pulse code selectors.
Lynch Carrier Systems Inc.

35. Millivoltmeter recorder

Portable millivoltmeter recorders for use in electrolysis survey work are described in a Bristol bulletin. The four-page publication discusses the use of the instrument in surveys of electrolytic corrosion and deterioriation of underground structures.
Bristol Co.

36. Tone squelch device

General Electric's new Channel Guard tone squelch device has been described in a new bulletin. The device has been designed to reduce interference problems in two-way radio systems. Bulletin ECR 449 describes how unwanted signals and transmissions may be avoided.
General Electric

37. Gas chromatograph

A four-page brochure describes the new Beckman 220 industrial gas chromatograph. The new instrument has been specifically designed for the continuous, automatic analysis of process streams, using a new sampling valve and timing system.
Beckman Instruments Inc.

news • *Continued*

from page 70

Utilities warned about stock rights offerings

Public utilities have been advised by a New York investment company executive to avoid, if possible, offering new issues of common stock through the medium of stock rights, a practice currently in favor.

The advice was given to utility officers attending the 39th annual convention of the Oklahoma Utilities Association by Frederick W. Page, vice president of Tri-Continental Corp., Broad Street Investing Corp., National Investors Corp., and Whitehall Fund.

"Largely because rights tend to dilute per share earnings," Mr. Page said, "I strongly recommend against the offering of stock through rights.

"Some stockholders," he added, "are in favor of rights under the false impression that it gives them a good investment opportunity or that it is a form of an extra dividend. From the long-term point of view, they are better off if you do not offer through rights.

"It is an expensive form of financing for the utility. The rights must have some value and, in order to give them value, you must price the stock below the market. This means you are going to have to issue more shares to get in the same number of dollars than if you priced the stock at the market. The resulting unnecessary dilution will not help your per share earnings. Over the long run, the higher per share earnings and dividends obtained by eliminating this unnecessary dilution will do more for the bulk of your stockholders than is done by giving them occasional rights.

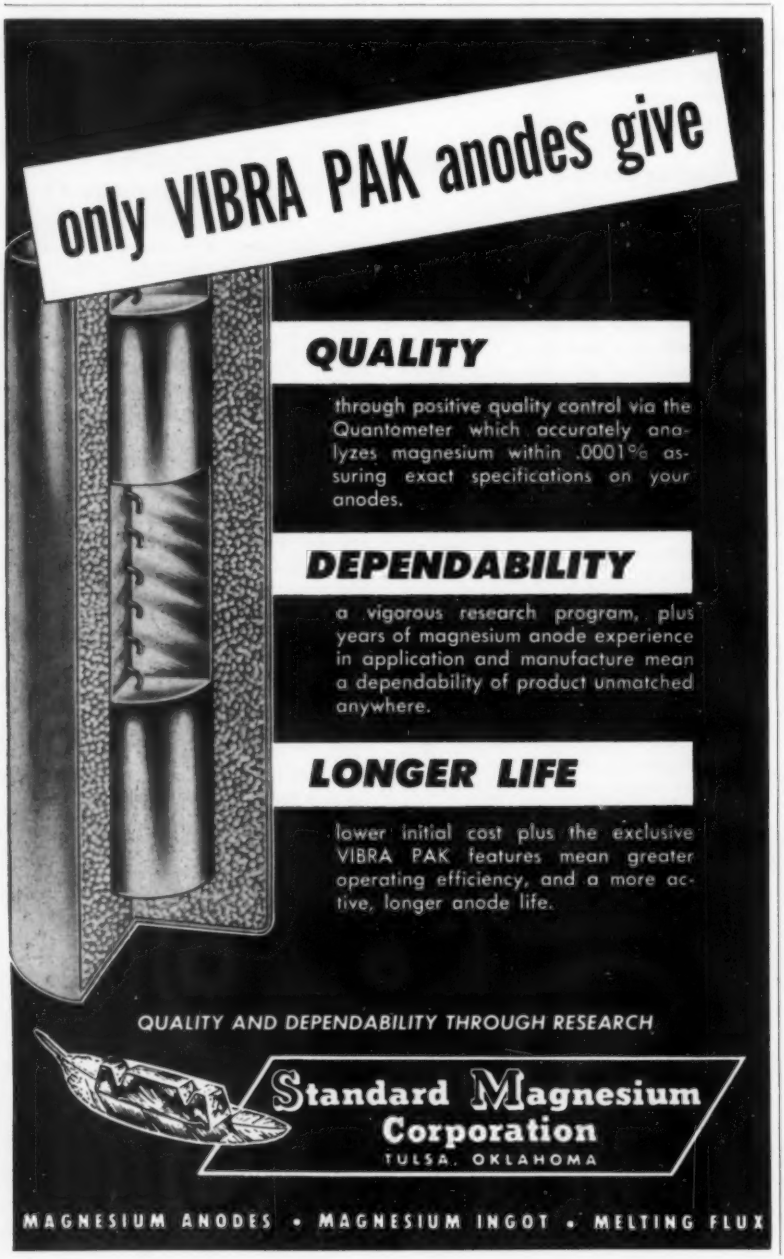
"In addition to being expensive," the investment manager said, "a rights offering usually depresses the stock during the rights period and most stockholders sell their rights on a depressed market. Don't be deceived when you see that a rights issue has been fully subscribed. The chances are that a majority of the subscriptions came from rights that were bought on the market and not from the original stockholders. A rights offering either dilutes the stockholder or forces him to increase his investment in the company. He may not be financially able to increase his investment or he may already have all he wants invested in the company. If not, he can always add to his investment through purchases in the open market."

"If you can improve the investment standing of your common stock," Mr. Page advised, "you will reduce your overall cost (of capital) and you will find that the financing of your bonds and preferred stock will be greatly simplified. Any bond buyer will put great weight on the investment standing of your common."

He said that his companies have an investment of $101 million in utilities, or slightly more than 20 per cent of their assets, and the investment company industry as a whole has over $1.1 billion invested in utilities securities.

He told the utility men that "if you can show steady gains (in per share earnings), even though small, you will find that investor confidence will grow."

Mr. Page cited five factors which he said he believed could be used to accomplish "a steady upward trend in per share earnings." These were (1) rate of return, (2)


only VIBRA PAK anodes give
QUALITY
through positive quality control via the Quantometer which accurately analyzes magnesium within .0001% assuring exact specifications on your anodes.
DEPENDABILITY
a vigorous research program, plus years of magnesium anode experience in application and manufacture mean a dependability of product unmatched anywhere.
LONGER LIFE
lower initial cost plus the exclusive VIBRA PAK features mean greater operating efficiency, and a more active, longer anode life.
QUALITY AND DEPENDABILITY THROUGH RESEARCH
Standard Magnesium Corporation
TULSA, OKLAHOMA
MAGNESIUM ANODES • MAGNESIUM INGOT • MELTING FLUX

capital structure, (3) reduction in cost of prior capital, (4) reinvestment of earnings, (5) common stock offerings.

He cited as his main thesis that "a steady upward trend in earnings and dividends is essential to a high appraisal of your earnings which, in turn, will give you low-cost financing."

"However," he said, "there are other factors that influence investor confidence, and the most important of these is management. Under our free enterprise system, management operates a company for the benefit of its common stockholders. If this were not so, utilities might just as well be publicly owned."

Management workshop scheduled for July

The sixth Utility Management Workshop is scheduled for July 28-Aug. 9 at Arden House, Harriman, N. Y.

The workshop, sponsored by the Department of Industrial & Management Engineering of Columbia University, is under the direction of Prof. Robert Teviot Livingston. It is designed specifically for utilities to meet the need for developing and extending management methods and concepts in the light of particular problem areas. Over the past five years, the workshop has taken up such problems as human relations, management development, and the total process of management in the modern utility.

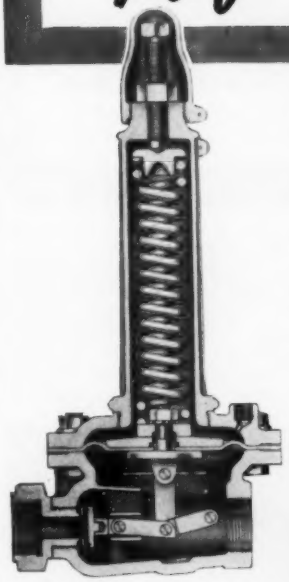
This year's workshop directs attention to the job of the manager and the problems of communication in management. A special feature of the workshop will be a panel on human relations in management. Members of the panel will be social scientists who are experts in this field.

California PUC studying state's gas supply

California's Public Utilities Commission has launched its own study of "present and potential adequacy of gas supplies and services" in California.

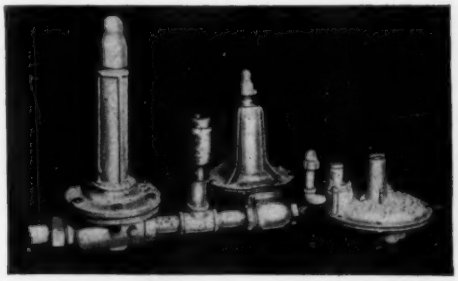
The study will also cover rate structures as they apply to industry, to steam-generating fuels and other classes of consumers. Specifically, the investigation will glean evidence on companies' ability to meet increasing demands, estimates of supply for the next 10 years, practices in regard to

IN THE HIGH PRESSURE FIELD
THERE IS SAFETY
IN *Reynolds* ...



Accurate, Safe Control

of tremendous pressures is an ever present problem in the gas field. Reynolds field Regulator illustrated at left is one of the many high pressure regulators built by Reynolds. It is thoroughly tested and proved in service. It handles up to 1,000 pounds safely reducing same to pounds. For more than fifty-five years Reynolds has designed and built gas regulators. Safety, accurate performance, years of service—these are some of the built-in factors responsible for Reynolds enviable position in the Gas Control Field.



Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.
GAS CONTROL SINCE 1892

100% Sales Acceptance on FREE Trial Offer
of the all new Fisher "Electronic Witch" M-SCOPE Pipe Finder
10 DAYS FREE TRIAL

In your field, 100% of those who take the famous "Electronic Witch" on FREE TRIAL actually purchase it! Here is absolute proof of unsurpassed performance. Outperforms any pipe locator on the market regardless of price. Test this new Pipe and Cable Finder under YOUR actual working conditions. State on your company purchase order that you want 10 day FREE TRIAL OFFER. Your only expense is the nominal shipping charge.

ONLY $172.50
with indestructible Fiberglas cabinets.

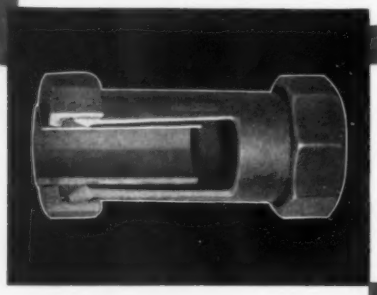
Send for 1957 CATALOG. Complete Pipe Finding, Leak Detecting and Corrosion Control Equipment.

FISHER Research Laboratory, Inc.
Dept. G-2, Palo Alto, Calif.
Geophysical Instruments Since 1932

NORMAC

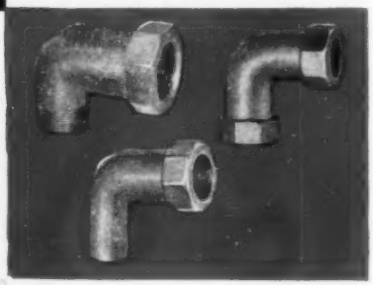
Couplings, Sleeves and Fittings for ☆ UNIFORMITY ☆ DEPENDABILITY ☆ ADAPTABILITY

Normac gas distribution products are engineered and manufactured to meet every requirement of modern gas distribution. Write today for catalog.



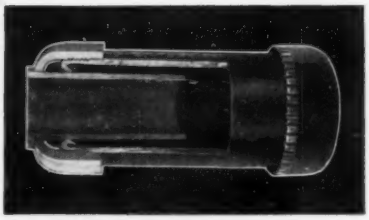
NORMAC COUPLINGS
Normac malleable couplings and sleeves offer the ultimate in deflection and strength with a center wall thickness greater than the wall thickness of the service pipe on which they are used. Every Normac fitting is individually air tested.

COMPRESSION-END "ELLS"
Normac ells of all types incorporate every feature of the Normac coupling plus full coupling depth.



COMPRESSION-END SERVICE "TEE"
Full coupling depth. Special threads on male end prevent dropping into old hand taps.

NORMAC #50-A STEEL COUPLINGS
Manufactured from extra heavy wall pipe. Couplings are available with either seamless or welded centers in sizes from ¾" to 1½" inclusive. 10" and special length centers available.



Normac also manufactures a complete line of red brass fittings in O.D. sizes: ⅜", ⅞", 1⅛", 1⅜"—and a complete line of insulated couplings and fittings.

NORTON-McMURRAY MFG. CO.
122 South Michigan Avenue — Chicago 3, Illinois

priority of service among various categories of customers, and steps being taken or contemplated to augment future supplies of gas.

States acting on relocation bills

North Dakota's attorney general has questioned the constitutionality of the recently passed law providing for reimbursement to utilities who must move facilities to make room for highway construction.

The official, in an opinion requested by the highway commissioner, said it was "highly probable" that the new law violated a section of the state constitution which makes it illegal for the state or any political subdivision to create or donate its funds to any individual, association, or corporation.

Concurrence of four of the five state supreme court justices is necessary to declare a North Dakota law unconstitutional. Thus, the attorney general's opinion itself makes no change in the status of the law, which is scheduled to go into effect July1.

In Colorado, the highway commission urged Governor McNichols to veto a legislative bill requiring the state department of highways to pay relocation costs. The commission held that the measure was "not in the public interest." According to the highway commission, the bill, which was passed by the Colorado legislature, would divert about $3 million a year from the department's funds and would "curtail the highway construction program."

The Maine senate passed a bill calling for reimbursement, despite the unfavorable report from its highways committee. The measure still has to be acted upon by the house.

Relocation expense dispute flares up again

The growing furor over the alleged "$2 billion raid" on the federal highway trust fund by gas firms and other utilities through provisions permitting repayment of relocation expenses may be expensive to distributors.

The controversy over whether federal highway funds should be used to repay utilities for relocating pipes and poles as the new

41,000-mile highway network is built was believed to have ended last year when a compromise provision was put in the highway act.

Congress, after arguing bitterly about utility reimbursement finally agreed on a compromise provision designed, its sponsors bragged, to "preserve states rights" and still not be a giveaway. It provided that states which had a policy of reimbursing utilities for relocating during road construction, could continue the practice with the funds from the new road program.

Critics now complain that while only a few states had such laws last year, the "extensive utility lobbies" have gone to work to get all the states to pass such legislation.

"It was clearly not the intent of Congress to open the door for utility companies to grab such an unprecedented windfall," critics of the provision are shouting.

Rep. Robert E. Jones (D.-Ala.), one of the most outspoken opponeints of utility reimbursement, has introduced a bill in Congress (H. R. 6987) to block any payments from the highway fund unless they are to acquire land or interests in and needed for rights-of-way.

In addition, the bill would in the future prohibit any utility from locating "within the highway rights-of-way" except to cross the highways.

The attack on the reimbursement provision in the federal highway act opened shortly after it was revealed that the U. S. Labor Department had secured $365,000 out of the highway trust fund—established from extra gas and tire taxes — for "administrative expenses."

With the clamor at this "raid" in full cry, Representative Jones and other opponents of utility reimbursement started their drive to repeal the provision.

Support for repeal does not seem strong enough this year to cause much trouble. But it could build up next year, when only a small portion of the total highway program will have been started, and prevent further reimbursement.

Equitable Gas completes new feeder gas line

A recent ceremony marked the completion of Equitable Gas Co.'s new $1.5 million Delmont feeder line. Vice President James H. Marks turned the gate valve on the

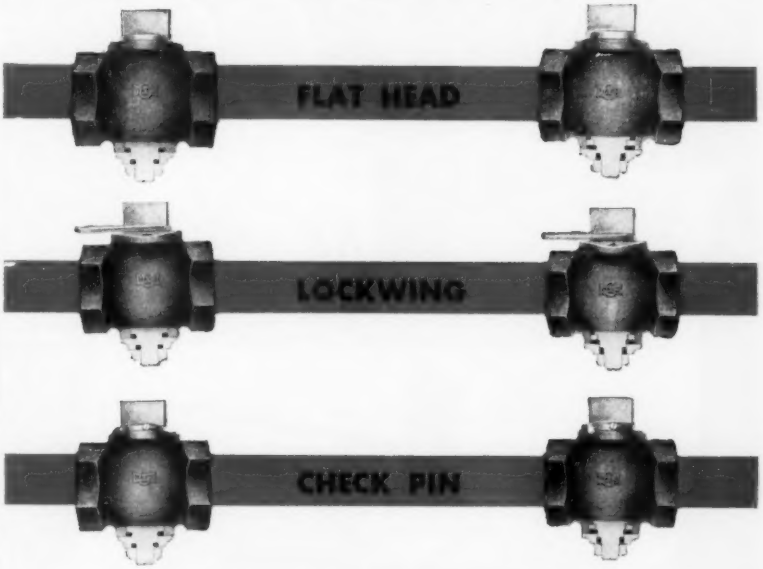
RIGHT on the LINE

HAYS STOPS FOR

SERVICE LINES • METERS • APPLIANCES

REGULAR PATTERN — Full Range of Sizes — "KEY-LOK" TAMPER PROOF

Iron Body with Brass Plug ... Black or Galvanized



Quality Assured — By Precision Machining ... Individual Testing ... Rigid Inspection

Quality Proven by Supplying the Gas Industry for Over 80 Years

Hays also manufactures a full line of all brass stops

STANDARD PACKAGING

Another Hays First

for Easy Handling ... Space Saving Storage

Write for Literature or ask "The Man From Hays"

HAYS®

GAS SERVICE PRODUCTS

HAYS MANUFACTURING CO.

ERIE, PA.

line at Peterman's Corner in Penn township, Pa.

The 18-mile line will feed gas northward to Oakmont, Verona, and communities along the Allegheny river. It connects with Texas Eastern Transmission Corp.'s 30-in. line from the Southwest which passes near Delmont.

Augmenting the supply of gas to the heavily populated East End area of Pittsburgh, the 16-in. high-pressure line is part of a general $9 million Equitable system improvement expenditure for 1957.

Opening the gate of Equitable's new Delmont line are (from left) C. J. Mulholland, vice president and treasurer; E. J. Ferguson, assistant general superintendent of distribution; William Goffe, Jr., system engineer; and J. H. Marks, vice president in charge of operations.

Previously it was necessary to transport gas across the city of Pittsburgh in order to supply Oakmont, Springdale, Verona, and the East End. Now the system supplying these communities can also be fed from the east. The new line also allows Equitable to take large volumes of gas directly into its distribution system, thereby making more transmission system capacity from Green county, Pa. to Pittsburgh.

Another benefit of the new project is a more flexible company operation in the area. In the event of line failure immediately south of Pittsburgh, Equitable could augment its supply by transferring delivery of large volumes of Texas Eastern gas from Green county to the Delmont line.

Eighteen approval standards revised

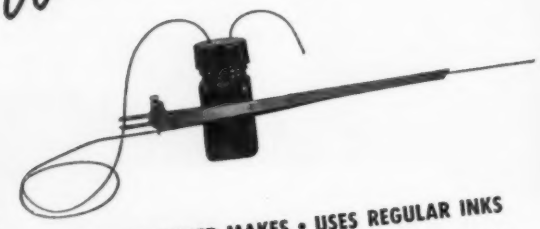
Revisions and additions to 18 of the current American Standards for gas appliances and accessories have been adopted by the ASA Sectional Committee, Project Z21, AGA approval requirements committee. Each of the proposed standards will be submitted to the American Standards Association for approval as American Standards.

The new provisions apply to free-standing type domestic gas ranges and built-in cooking units, central heating equipment, unit heaters, duct furnaces, room heaters, domestic clothes dryers, water

ARCCO

ARCCO CANNON NEVER-DRY PEN

Writes for Months



REPLACES OTHER MAKES • USES REGULAR INKS

Regardless of pulsations or other causes of ink failures this new Never-Dry Pen will make clean and complete records. Ink supply lasts for several months without refilling reservoir. Capillary tube from ink bottle placed in instrument case feeds pen with continuous flow. Closed system sealed from atmosphere prevents clogging and dirt accumulation.

Weight of pen is constant at all times thus insuring extreme accuracy. No slopping or dripping. Stainless steel construction—no corrosion. When ordering, specify make and type of recording instrument.

AMERICAN RECORDING CHART CO.

3113 E. 11th St. • Los Angeles 23, Calif.

$6.00 each Net
Send for quantity prices

SEND FOR BULLETIN No. 110-RI

heaters, commercial cooking equipment, and to the listing and installation requirements for domestic gas range conversion burners. The new provisions are to become effective Jan. 1, 1958. Equipment manufacturers, however, may have the new provisions applied to units received for test by the AGA Laboratories at any time prior to the effective data.

In general the new provisions incorporate editorial revisions to clarify the intent of the requirements, recommendations from the Task Force Studying Special Utility Requirements and strengthening provisions covering use of electrical components and wiring used on domestic gas ranges.

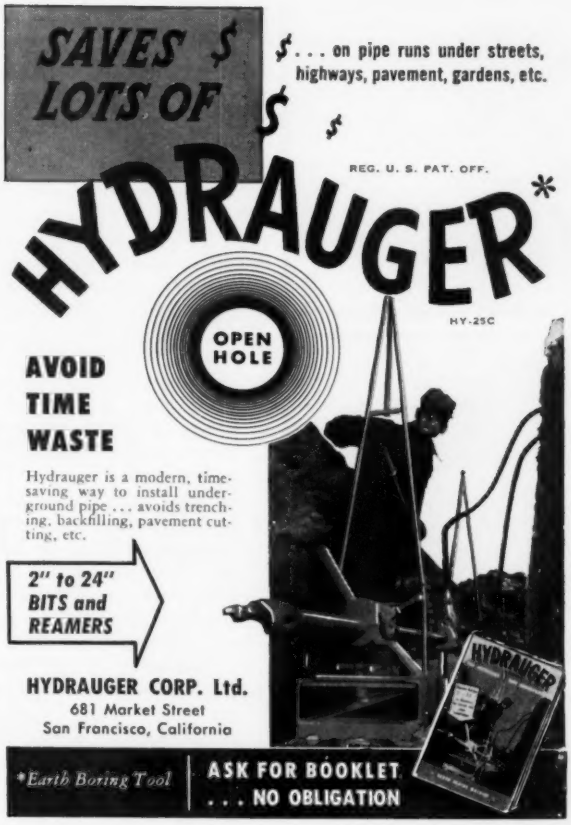
In the case of the electrical requirements for domestic gas ranges and domestic built-in cooking units, new provisions became effective April 1, 1957.

Further revisions to these electrical provisions were also approved by the approval requirements committee at the March 19 meeting and were placed in effect on April 1. In addition, these new provisions will apply to all domestic ranges and built-in cooking units produced after Jan. 1, 1958 regardless of the date of any previous approval.

Based on a survey of high altitude areas, which indicated that most utilities in such areas preferred units approved for low altitude operation which can readily be derated, the approval requirements committee agreed that all high altitude approvals listed in the AGA Laboratories Directory of Approved Appliances and Listed Accessories would be discontinued as of Jan. 1, 1958. Appliance ratings will be listed for elevations up to 2000 ft and for elevations above 2000 ft the rating is to be reduced at the rate of 4 per cent for each 1000 ft above sea level. Testing of appliances for high altitude performance by the labs will also be discontinued.

Provisions for domestic gas water heaters have been expanded considerably to cover the approval testing of flush, recessed or concealed counter-type models and also have been expanded to cover adequately the usage of automatic gas shutoff devices on gas water heaters.

Provisions have been incorporated in the proposed American Standards for gas-fired unit heaters and duct furnaces to permit


SAVES $ LOTS OF $
$ . . . on pipe runs under streets, highways, pavement, gardens, etc.
REG. U. S. PAT. OFF.
HYDRAUGER*
HY-25C
OPEN HOLE
AVOID TIME WASTE
Hydrauger is a modern, time-saving way to install underground pipe . . . avoids trenching, backfilling, pavement cutting, etc.
2" to 24" BITS and REAMERS
HYDRAUGER CORP. Ltd.
681 Market Street
San Francisco, California
*Earth Boring Tool
ASK FOR BOOKLET . . . NO OBLIGATION

What's inside makes a big difference!

A hole in your meter diaphragm means lost accuracy.

Vulcan Synthetic Diaphragms stay dependably gas-tight – won't dry out or crack – need no lubrication.

Vulcan is the pioneer in the synthetic diaphragm field – and stays ahead with ultra modern facilities for development and manufacturing.

Specify Vulcan . . . and be sure

Another REEVES VULCAN RUBBER PRODUCT

REEVES BROTHERS INC.

Vulcan Rubber Products Division

54 Worth Street, N. Y. 13, N. Y.

Gas Meter Diaphragms
Diaphragms for Regulators & Controls

news • *Continued*

optional natural gas approvals.

Included in the proposed requirements for domestic gas clothes dryers are provisions requiring that all approved clothes dryers be provided with means for exhaust duct connection or other means for disposal of moisture and lint.

A cake-baking load has been specified in the new requirements covering the oven heat distribution test for hotel and restaurant ranges and portable gas baking ovens.

Under the new requirements for gas counter appliances, an automatic pilot is required on all burners located in enclosed compartments, except commercial hot plates and griddles. It was believed that easily visible instructions are very important on commercial cooking equipment in view of the many people operating this type of equipment and frequent use of different types of equipment in the same establishment.

Extensive editorial revisions have been made in the requirements covering central heating gas appliances. Provisions covering flue gas baffle temperatures have been added to prevent baffles from being fabricated from metals unsuitable for the temperatures involved which could readily result in early deterioration of the baffle, consequent failure of the appliance to continue to comply with the requirements and possible hazard in service.

Of particular interest in connection with central furnaces is a revised test procedure for furnaces intended for installation and operation at a temperature rise from 50° to 70°F, which is the range of temperature rise necessary for units used in conjunction with cooling equipment. And, a limit control is to be provided with all gravity type furnaces. The temperature limit control is to be of the recycling type furnished with the unit but need not be mounted at time of shipment.

The revisions pertaining to floor furnaces and vented recessed heaters parallel the changes made for boilers and furnaces. For vented recessed heaters, however, provisions covering the use of flame spreaders have been added in view of the increased trend toward the use of single port burners. Although this type of burner is not commonly used at this time, incorporation of suitable provisions are believed desirable in the event the use of such burners becomes more general.

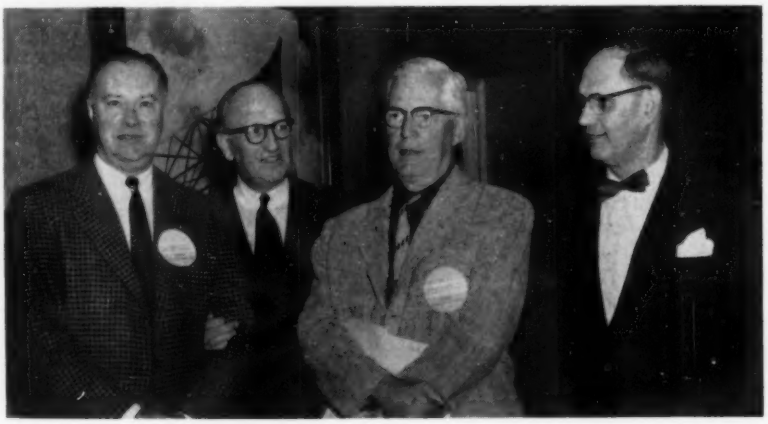
GAS news notes

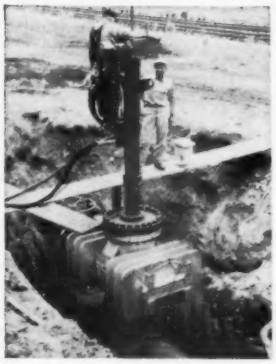
Voters in Deshler, Neb., approved an issue by which the city will purchase the gas distribution system from Kansas-Nebraska Gas Co. A court condemnation will set a price to be paid by the city for the system.

For the fifth straight year, Oklahoma Natural Gas Co. has won the grand prize for its booth at the Oklahoma City home show.

Fisher Governor Co., Marshalltown, Iowa, has appointed Power & Controls Inc., Seattle, as sales representatives in the Washington state territory.

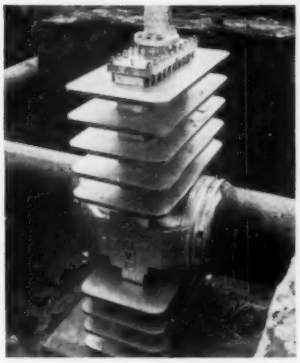
GAMA officials gathered for directors meeting which opened the annual conference. From left: Clifford Coons, newly elected president; H. Leigh Whitelaw, GAMA's executive vice president; Stanley Hobson, treasurer; and Wendell C. Davis, 2nd vice president.

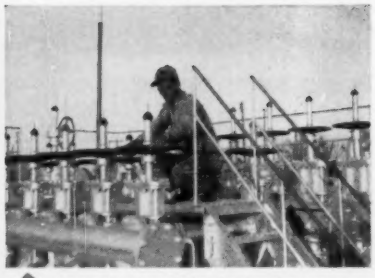




Perfect through-conduit alignment simplifies hot tapping through this 22" ASA 600 valve.

34" full opening high pressure gas valve will stay bubble-tight underground—with no lubrication or maintenance.



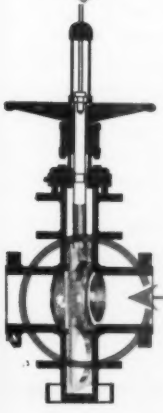


Ease of operation is of prime importance on frequently used manifold installations.

PERFORMANCE in the field points up the BIG DIFFERENCE

—in bubble-tight seal you can check in the line
—in easier operation with no wedging or jamming
—in lower maintenance with no need for lubrication
—in through-conduit always in line with the line

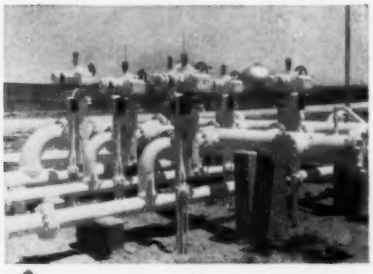
Thousands of pipeline, manifold and storage installations in gas and liquid services are daily adding to the record of performance that makes Grove *Seal-O-Ring* Gate Valves stand out as the practical answer to operating problems. If you have any doubt, ask men who are using them. It will pay you to specify Grove *Seal-O-Ring* Valves with the fabricated steel body—2" to 36"—in any standard pressure. Call your Grove representative or write today for details.



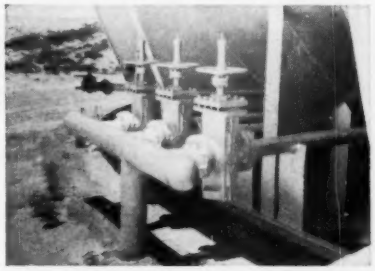
THE WHOLE VALVE IS RIGHT HERE

When valve is full open or closed, bubble-tight seals on both sides of the gate completely isolate line pressure in the conduit. The body, serving merely as framework for operating mechanism and to prevent loss of product while gate is in motion, may be drained or vented to atmosphere when gate is open or closed. Integrity of seals can be checked any time by a tell-tale valve on the body.

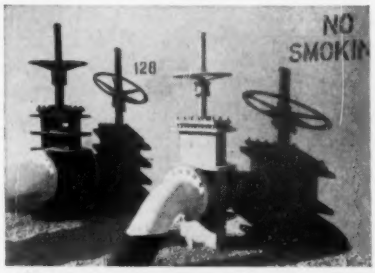
703



Products manifold at pipeline station illustrates typical motor-operated *Seal-O-Ring* Valve application.



LPG tank-to-pipeline is critical service where it's well to be able to check seal in the line—any time.



Self-cleaning feature is particularly important on crude oil tank lines.

GROVE SEAL-"O"-RING Gate Valves

SUBSIDIARY OF WALWORTH

GROVE VALVE and REGULATOR COMPANY • 6529 Hollis St., Oakland 8, Calif.
HOUSTON 23—3517 Polk Ave. • • • • • **LOS ANGELES 6**—1930 W. Olympic Blvd.

GROVE SEAL RING ® GROVE SIMPLICITY ACCURACY SAFETY

ODESSA, TEXAS • TULSA, OKLAHOMA • CHICAGO, ILLINOIS • DENVER, COLORADO • In Western Canada: GROVE VALVE LIMITED, EDMONTON

CUT COSTS

ON UNDERGROUND

PIPING JOBS

...with a GREENLEE PIPE PUSHER

Installing pipe underground is quick and simple this way. With a GREENLEE Hydraulic Pipe Pusher *one man* pushes pipe through the ground—under streets, railways, walks, lawns, floors. Saves time, cuts costs through elimination of extensive ditching as just a short trench accommodates the Pusher. No tearing up of pavement, lawns, floors... eliminates tunneling, back-filling, tamping, repaving. Cuts job time to a fraction. Pusher often pays for itself through timesavings on first job or two.

No. 790 GREENLEE PUSHER For 3 4 to 4-inch pipe. Six speeds—5,600 to 40,000 lbs. pushing pressure.

No. 795 GREENLEE PUSHER For pipe larger than 4-inch, concrete sewer pipe, large drainage ducts. Six speeds—25,000 to 150,000 lbs. pushing pressure.

POWER PUMP For both sizes of GREENLEE Pushers. Pushes pipe at rate of two feet per minute.

GREENLEE

TOOLS FOR CRAFTSMEN

Write today for descriptive literature. Greenlee Tool Co., 1946 Columbia Ave., Rockford, Ill., U. S. A.

GAS associations

C. V. Coons heads GAMA for coming year

Clifford V. Coons, executive vice president of Rheem Manufacturing Co., New York, heads the new slate of officers of the Gas Appliance Manufacturers Association. They were elected at the 22nd annual convention of the group at White Sulphur Springs, W. Va.

Mr. Coons, now vice president of GAMA, will take office as president in October, succeeding Julius Klein, president of Caloric Appliance Corp., Philadelphia.

Other officers are: 1st vice president, Edward A. Norman, Jr., president of Norman Products Co.; 2nd vice president, Wendell C. Davis, president of Cribben & Sexton Co.; treasurer, Stanley H. Hobson, president of Geo. D. Roper Corp.

Utility accountants discuss future

The future in utilities accounting, including the role of electronic machines, received a major share of attention at the National Conference of Electric & Gas Utility Accountants held recently in Washington, D. C. More than 1100 delegates, a near-record attendance for the conference, attended the three-day meeting jointly sponsored by the accounting sections of the American Gas Association and the Edison Electric Institute.

C. Hamilton Moses, lawyer and former president of Arkansas Power & Light Co., described the next quarter century as crucial, with decisions to be made that will shape history for a thousand years. Among coming events he envisioned a population growth of 20 million new families, 25 million new homes, and a gross national product of $1 trillion a year.

John F. Childs, vice president of Irving Trust Co., pointed out that the future financial health of utili-

STOP H_2S CORROSION BEFORE IT STARTS!

The Connelly IRON SPONGE purification process at the well site removes hydrogen sulphide BEFORE the gas is piped to central processing. Thus, the cause of pipe line corrosion is eliminated because corrosive gas never enters the transmission lines. Additionally, Connelly IRON SPONGE eliminates the need for extreme close control. It operates with high efficiency at low or high pressures—absorbs more H_2S, gives longer service between foulings and is easily regenerated. If you have a purification problem check this MOST ECONOMICAL solution today. Write for Field Processing Bulletin #OG-7.

CONNELLY

Incorporated

3164 S. CALIFORNIA AVE.

CHICAGO 8, ILLINOIS

Elizabeth, New Jersey

ties would depend on an adequate understanding of fair return, and on the importance of public relations. In addition, he reported on a survey on the handling of accelerated depreciation. The treatment of accelerated depreciation, he said, would become one of the important considerations in valuation of utility securities in the near future.

The problem of communications with employees and the community was discussed by Walter G. Barlow, vice president of Opinion Research Corp. Company managements generally are given high votes by workers and public for organizing and managing ability, he said, but rated lower on humanitarianism and interest in people as people. To correct misconceptions and develop an atmosphere of frankness and goodwill, 99 per cent of the nation's larger corporations are either maintaining or increasing their communications budgets. They are making increasing use, Mr. Barlow said, of information and communications experts to step up such activities as institutional advertising, plant tours, special mailings, and information sent to opinion leaders. He pointed out the importance of self-interest in all human relations and said communications tools should be utilized to create an identification between company interest and the self-interest of employees and the public.

Award set up by AGA for outstanding PR job

Outstanding public relations efforts in the gas industry will be rewarded this year during the AGA convention in October. All AGA member companies are eligible to compete for the new "AGA Public Relations Achievement Award."

T. H. Evans, chairman of the association's general public information planning committee, reports that a trophy will be presented annually for outstanding achievement in solving a specific PR problem. The winning activity must have contributed to the development of better public opinion and understanding of the company, gas service, or of the gas industry.

Accompanying the trophy will be an engraved certificate of achievement citing the winning company's name and the public relations accomplishment. Certificates of merit may also be granted to other member companies with deserving entries.

Low, compact 155 digs 10 FEET DEEP

Small in size, big in capacity, Parsons 155 Trenchliner handles everything from mainline extensions to pipe reclamation and residential service connections. Developed especially for city work, this low, compact trencher cuts 16 to 26 inches wide — *at depths to 10 feet* — digs from 5.8 inches to 25 lineal feet per minute.

Operates in congested areas

The 155 works under low-hanging branches, in narrow alleys, between houses, and in other crowded areas, normally inaccessible to trenchers of comparable capacity. Height is only 7 feet-4 inches — width 5 feet-4 inches. It undercuts walks, curbs, cross-pipes — saves hand clean-up — also makes vertical set-ins, flush with foundations. Hinged crumber swings up, out of the way — positive down-crowd boom starts cut fast, holds accurate grade. Want more facts? See your local Parsons distributor or write to us *today*.

The 155's close side-clearance puts trench within 21 inches of fences, poles, walls. Power-shift spoil conveyor dodges side obstructions. Belt-direction is instantly reversible, places spoil bank on either side of trench. Other Parsons sizes and types range from a small, rubber-tired Trenchmobile to large wheel-type "big-inch" and "middle-inch" Trenchliners.

mail today

PARSONS Company, Newton, Iowa

for literature on 155 Trenchliner

NAME_____ TITLE_____

COMPANY_____ DIV._____

STREET_____

CITY_____ STATE_____

Also interested in ☐ wheel-type Trenchliners ☐ rubber-tired Trenchmobile®

P794 GAS

PARSONS TRENCHLINERS®

A DIVISION OF KOEHRING COMPANY

"FASTER AND CHEAPER DIGGING EVEN IN WET, STICKY SOIL"

Says R. K. Nichols
Los Gatos Construction Co.
Los Gatos, California

"In laying telephone cable for Pacific Tel. & Tel. Co. in Salinas, Calif., we were able to start the job early, even in extremely wet and sticky mud . . . thanks to our 524T Pow-R-Ditcher. It dug very well at 9 feet per minute under tough conditions."

POW-R-DITCHER DIGS 1'-15' PER MINUTE— 8" to 24" Wide

An ideal, low cost, rugged ditcher for contractors, municipalities, utility companies, etc. One-man operation. 2-way side conveyor. Easy to transport. It's the BIG ditcher with the low price. Smaller models also available.

Some excellent sales territory available

VERMEER MFG. CO. 1441 W. WASHINGTON PELLA, IOWA

ANCHOR'S BUTANE & PROPANE STAND-BY PLANT PACKAGE

ENGINEERING, INSTALLATION

Anchor's Engineering Dept. will design and supervise plant construction.

FINANCING

Anchor's experienced staff will assist with the financial details..

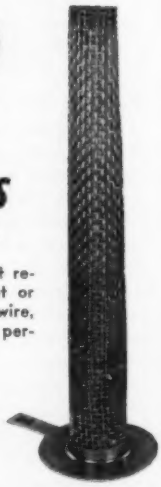
SUPPLIES

Huge tank car fleet, many plants and vast underground storage assure adequate supplies.

ANCHOR PETROLEUM COMPANY
TULSA — CHerry 2-7261

SANDUSKY MAC-IRON OHIO
ESTABLISHED 1901

***IN-LINE STRAINERS* TO ORDER**



Strainers to your exact requirements . . . basket or conical . . . woven wire, single and duplex, or perforated plate.

All types available in carbon steel, Monel, and stainless.

Specialists to the Petro-Chemical Engineering and associated fields, the Mac-Iron operation is based on scope, quality, and service. Also manufacturers of stock and specification blinds, spacer rings, permanent and temporary strainers, filters, and pivot flanges.

Write today for complete information and literature.

The Mack Iron Works Company
Warren and Water Sts. - Sandusky, Ohio

associations • *Continued*

Walter Dyer is editor of AGA publication

Walter H. Dyer has been named editor of the *AGA Monthly*, succeeding Vaughan O'Brien, who has been named secretary of the association's general management section.

Mr. Dyer for the past four years has been editor of publications for the Mueller Co., Decatur, Ill. Before that he held executive editorial positions with the Brookfield (Mo.) Daily News-Bulletin, the St. Joseph (Mo.) Gazette, and the Freeport (Texas) Daily Facts-Review.

Three other men have joined the headquarters office in New York.

Samuel J. Cunningham is research assistant to the research bureau. He was formerly with Cities Service Oil Co. Joseph F. Giaccone joins the staff of the bureau of statistics after 10 years with the American Transit Association. W. Roger Sarno has joined the utilization bureau as assistant utilization engineer.

Florida-Georgia gasmen meet

Joseph Frink, Florida Power & Light Co., Miami, was elected chairman of the Florida-Georgia Gas Association at the group's annual meeting in Miami Beach. He succeeds A. H. Gaede of Florida Home Gas Co. New secretary-treasurer is L. A. Friederich of the Tampa (Fla.) Gas Co.

Outgoing chairman of the general committee of the Southwestern Gas Measurement short course, Roy S. Peace Jr. (left), Southern Natural Gas Co., passes the gavel to the incoming chairman, T. J. Kirkpatrick, Panhandle Eastern Pipe Line Co. Ceremony took place at the 32nd annual short course held at the University of Oklahoma. More than 900 people attended the three-day session.

Industrial gasmen optimistic on new orders

Manufacturers of industrial gas equipment and utilities supplying the fuel are continuing to gain in the country's huge-scale industrial expansion, and find demand in great measure boosted by new technical developments.

This was brought out at sessions of the AGA's sales conference on industrial and commercial gas, and of GAMA, which was represented at the event by a delegation of industrial and commercial equipment producers.

Automation and development of existing automatic production processes are given a major role in the gas industry's industrial future. Among many other factors noted are growing demand by the petrochemical industry, development of the new "protective atmosphere" applications, and a method for using gas with oil in firing open hearths in steel making.

Many metal-working operations, particularly those involving automatic forging, are increasing demand for industrial equipment, it was brought out at a breakfast meeting of the manufacturer's industrial division.

E. J. Funk, Jr., GAMA industrial division chairman, said that heating in preparation for forging is meeting new high standards of speed and accuracy to keep up with ultra-modern automatic machines. He noted the growth of applications in which gas is burned under special conditions to provide protective atmospheres for synthetic textile manufacturing, alfalfa storage, and other uses.

Equipment orders to members of his division during the first quarter gave no hint of major slackening of the record pace of industrial expansion, Mr. Funk said.

The appliance manufacturer observations are in accord with those expressed at the New Orleans conference by J. Robert Delaney, chairman of the AGA industrial and commercial section and vice president in charge of gas sales for Cincinnati Gas & Electric.

"I see no sign of a real letup and certainly none in the Ohio valley," he commented.

Harold Massey, GAMA managing director, pointed out that a single large industrial development can bring orders for a wide variety of gas equipment—boilers, drying ovens, water heaters, cafeteria equipment, and much more.

Illinois Central Photo

No Margin for Error

Lancaster S-700 Complete Diaphragm
for small meters

When it comes to accurate gas measurement, you can't beat the smooth, floating action of a diaphragm that is perfectly centered in the meter.

That's one reason why so many meter shops are switching to Lancaster's complete diaphragm with the built-in adjustable carrier wire assembly. Send for a sample and test it for accuracy.

Lancaster METER PARTS CO.
Manufacturers of Quality Parts for Gas Meters
POST OFFICE BOX 378 LANCASTER, OHIO

CLIP THIS AND MAIL TODAY
if you have not subscribed to . . . GAS

GAS 198 SOUTH ALVARADO STREET, LOS ANGELES 57, CALIFORNIA
Standard Rates Apply to U. S. & Possessions

☐ Check herewith ☐ Bill me ☐ 2 years $3.00 ☐ 1 year $2.00

Name _____ Title _____

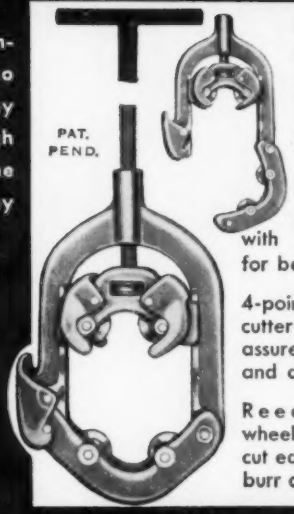
Firm _____

Street _____

City _____ Zone ____ State _____

IF YOU CUT LARGE DIAMETER PIPE...
YOU NEED THESE
New REED HINGED 4-WHEEL PIPE CUTTERS
Four sizes cover the range from 2½" to 12"

Users tell us these completely new cutters are so efficient they often "pay for themselves" through the savings in crew time on a half-dozen cuts. They are the first really practical tools for cutting off steel or cast iron pipe in sizes from 2½" to 12". You can, for example, cut 8" steel pipe completely off in less than five minutes.



Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

Closed frame permits light weight with complete rigidity for better cutting.

4-point guide aligns the cutter on the pipe . . . assures perfect tracking and a right angle cut.

Reed Razor Blade wheels track perfectly, cut easily and roll down burr on steel pipe.

Unconditionally guaranteed to be the most efficient cutter you have ever used. Ask your jobber or write for literature.

REED MANUFACTURING COMPANY
ERIE, PENNSYLVANIA • U. S. A.

for **leakproof, pressure-tight connections**

use TiteSeal®
SEALING COMPOUNDS

Heat and vibration-proof, non-solvent, will not shrink, crack or crumble. Makes all assemblies leak-proof and pressure-tight. Prevents rust, corrosion, joint seizure.

7 BASIC BLENDS

LIQUID WRENCH®
The super-penetrating rust solvent

LOOSENS rusted bolts, nuts, screws, 'frozen' parts

Liquid Wrench works *fast*...yet is absolutely safe for all metals and alloys.

2171

At Industrial, Automotive, Hardware, Plumbing Jobbers

RADIATOR SPECIALTY CO.
Charlotte, North Carolina

SOLDER SEAL

WARRENGAS *the Concentrated fuel*

GULF GULFTANE LP-GAS BUTANE PROPANE

WARREN
PETROLEUM CORPORATION
LIQUEFIED PETROLEUM GAS DIVISION
TULSA, OKLAHOMA

SALES OFFICES:
FORT WORTH, TEXAS
HOUSTON, TEXAS
LOUISVILLE, KENTUCKY
MADISON, WISCONSIN
MIDLAND, TEXAS
JACKSON, MISSISSIPPI
ST. LOUIS, MISSOURI
NEW YORK, NEW YORK
OMAHA, NEBRASKA
COLUMBIA, SOUTH CAROLINA
TAMPA, FLORIDA
SAN FRANCISCO, CALIFORNIA
BRYN MAWR, PENNSYLVANIA

GAS calendar

June

4- 6. Second Annual Appalachian Underground Corrosion Short Course—West Virginia University, Morgantown.

12-14. NEGA Gas Measurement School—Worcester Polytechnic Institute, Worcester, Mass.

23-25. Wisconsin Public Utilities Association Accounting Section Convention—King's Gateway Hotel, Land O'Lakes, Wis.

24-27. Canadian Gas Association—Jasper Park Lodge, Jasper, Alberta, Canada.

24-25. Michigan Gas Association—Grand Hotel, Mackinac Island, Mich.

24-27. American Society of Heating & Air Conditioning Engineers Semi-Annual Meeting—Murray Bay, Quebec, Canada.

September

3- 5. Pacific Coast Gas Association Annual Convention—San Francisco.

6. New Jersey Gas Association Annual Meeting—Spring Lake, N. J.

9-10. INGAA Annual Meeting—Shamrock Hilton Hotel, Houston, Texas.

9-13. AGA Industrial Gas School—Hotel William Penn, Pittsburgh.

10-12. Mid West Gas Association Gas School and Conference—Iowa State College, Ames.

11-13. National Petroleum Association 55th Annual Meeting—Traymore Hotel, Atlantic City.

12. NEGA Safety Conference—Hotel Statler, Boston.

13-14. Maryland Utilities Association 33rd Annual Fall Conference—Cavalier Hotel, Virginia Beach, Va.

16-18. AGA 9th Annual Accident Prevention Conference—St. Louis, Mo.

18-20. Southeastern Gas Association Convention—Robert E. Lee Hotel, Winston Salem, N. C.

23-25. American Society of Mechanical Engineers—Statler Hotel, Hartford, Conn.

October

1- 2. Texas Mid-Continent Oil & Gas Association 38th Annual Meeting—Texas Hotel, Fort Worth.

7- 9. AGA Annual Convention—Kiel Auditorium, St. Louis, Mo.

10-11. California Natural Gasoline Association Annual Fall Meeting—Huntington-Sheraton Hotel, Pasadena.

16-18..Wisconsin Utilities Association Gas & Electric Operation and Sales Sections Convention—Schroeder Hotel, Milwaukee.

21-25..National Safety Council—Conrad Hilton Hotel, Chicago.

November

6..NEGA Operating Division—Hotel Statler, Hartford, Conn.

11-14..American Petroleum Institute—Conrad Hilton Hotel, Chicago.

13-15..ASA 8th National Conference on Standards and 39th Annual Meeting—San Francisco. .. ..

14-16..American Society of Refrigerating Engineers Semi-Annual Meeting—Shoreland Hotel, Chicago.

18-19..SGA Annual Advisory Council & Management Conference—Point Clear, Ala.

18-22..National Warm Air Heating & Air Conditioning Association—Hotel Morrison, Chicago.

December

1- 6 American Society of Mechanical Engineers Annual Meeting—Hotel Statler, New York.

1958

January

23..NEGA Operating Division—Hotel Statler, Boston.

March

17-21..National Association of Corrosion Engineers—San Francisco.

20-21..New England Gas Association Annual Meeting—Hotel Statler, Boston.

24-26..Mid-West Gas Association—Broadmoor Hotel, Colorado Springs.

31-April 2..GAMA Annual Meeting—The Greenbrier, White Sulphur Springs, W. Va.

31-April 2..AGA General Management Section Conference—Washington, D. C.

April

8-10..AGA Sales Conference on Industrial & Commercial Gas—Hotel Schroeder, Milwaukee.

14-16..National Conference of Electric & Gas Utility Accountants—Shamrock-Hilton Hotel, Houston.

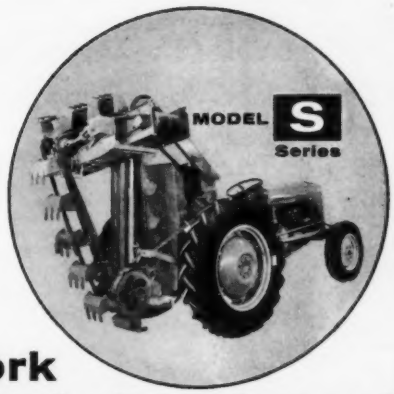
28-30..Southern Gas Association Annual Convention—Dallas.

May

5- 9..AGA Distribution, Production, and Transmission Conference—Roosevelt and Commodore Hotels, New York.

19-21..AGA Mid-west Regional Gas Sales Conference—Edgewater Beach Hotel, Chicago.

The Everett® Trencher



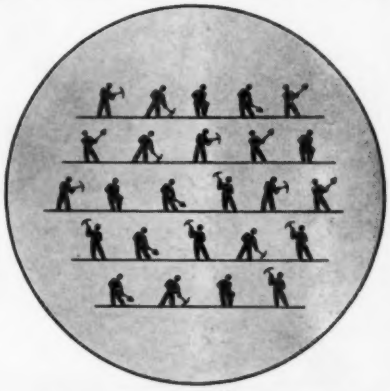
equals the work of 25 pick and shovel men!

Engineered and designed for the great new FORD and FERGUSON (as well as MASSEY-HARRIS MH-50) TRACTORS.

The Everett Trencher cuts clean straight trenches up to 42" deep, 12" to 18" in width. It operates from the power take-off of the tractor—raised and lowered by built-in hydraulic system. Quickly installed. A "V" belt safety slip feature is built into the drive of the trencher which automatically stops the bucket line and prevents damage when obstructions are encountered.

Note these advantages:

- **NEW built-in Rock Guard**
- **NEW single wheel design gives faster penetration**
- **NEW "V" Power Drive with V Belt Safety drive**
- **NEW easily accessible controls**



The Everett® Trencher Model 60

DIGS TRENCHES UP TO 5' DEEP AT LESS THAN HALF THE COST OF COMPARABLE MACHINERY.

The Model 60 will do a big digging job at a sensible price. Hydraulically operated it will dig close to buildings, pipes, etc.

Another Great EEC ***Product***

EARTH EQUIPMENT CORP.,
2036 Sacramento St., Los Angeles 21, Calif.
Please send full information on: G
☐ Model S Series Everett Trencher
☐ Model 60 Everett Trencher

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

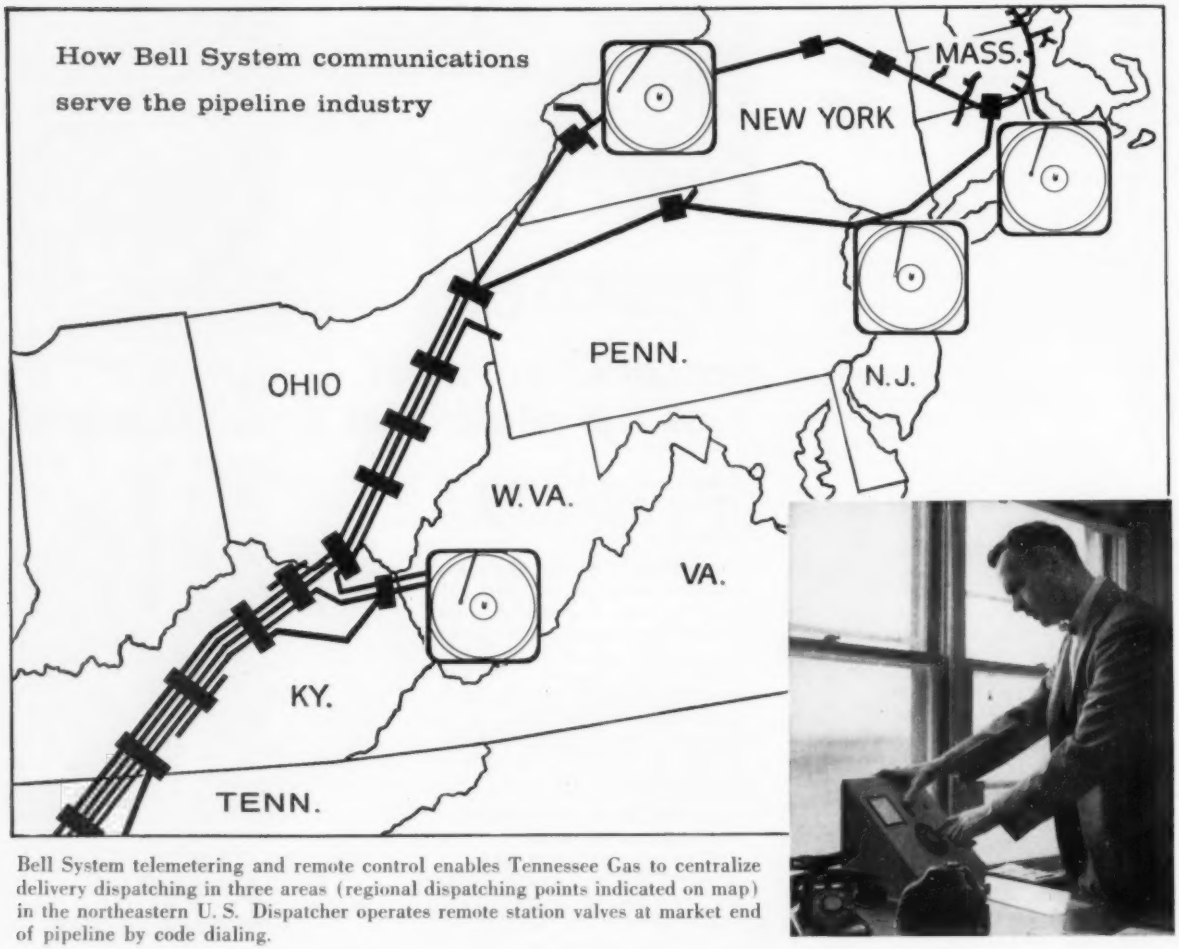
1897 1957

PIPE STOPPERS OF ALL KINDS

SAFETY GAS MAIN STOPPER CO. INC.

GOODMAN
USED SINCE 1897
Z HANDLE & LOCKING SLEEVE
GAS MAIN STOPPER

523 Atlantic Avenue
Brooklyn 17, N. Y.
Cable Address GASTOPPER, N. Y.



Bell System telemetering and remote control enables Tennessee Gas to centralize delivery dispatching in three areas (regional dispatching points indicated on map) in the northeastern U. S. Dispatcher operates remote station valves at market end of pipeline by code dialing.

Tennessee Gas pumps to market with the aid of remote metering and control

Bell System channels for remote metering and control permit Tennessee Gas Transmission Company dispatchers to regulate delivery at 16 unattended measuring points in the northeast.

Almost half of TGT's 1.8 billion cubic foot daily load is metered to four regional dispatching offices near major market areas. Over-all dispatching of the pipeline system is co-ordinated by Bell System private line telephone from Houston, Texas, headquarters.

TGT regional dispatchers open or close valves at delivery points by code dialing. A safety feature in the system enables them to stop delivery in 30 seconds in the event of an emergency.

• • •

Efficient communications can save manpower, keep costs down for you, too. Just call your Bell Telephone Company business office. A representative will discuss your needs.

BELL TELEPHONE SYSTEM

PRIVATE LINE TELEPHONE • PRIVATE LINE TELETYPEWRITER • DATA TRANSMISSION SYSTEMS

CHANNELS FOR: REMOTE METERING AND CONTROL • TELEPHOTOGRAPH • CLOSED CIRCUIT TV

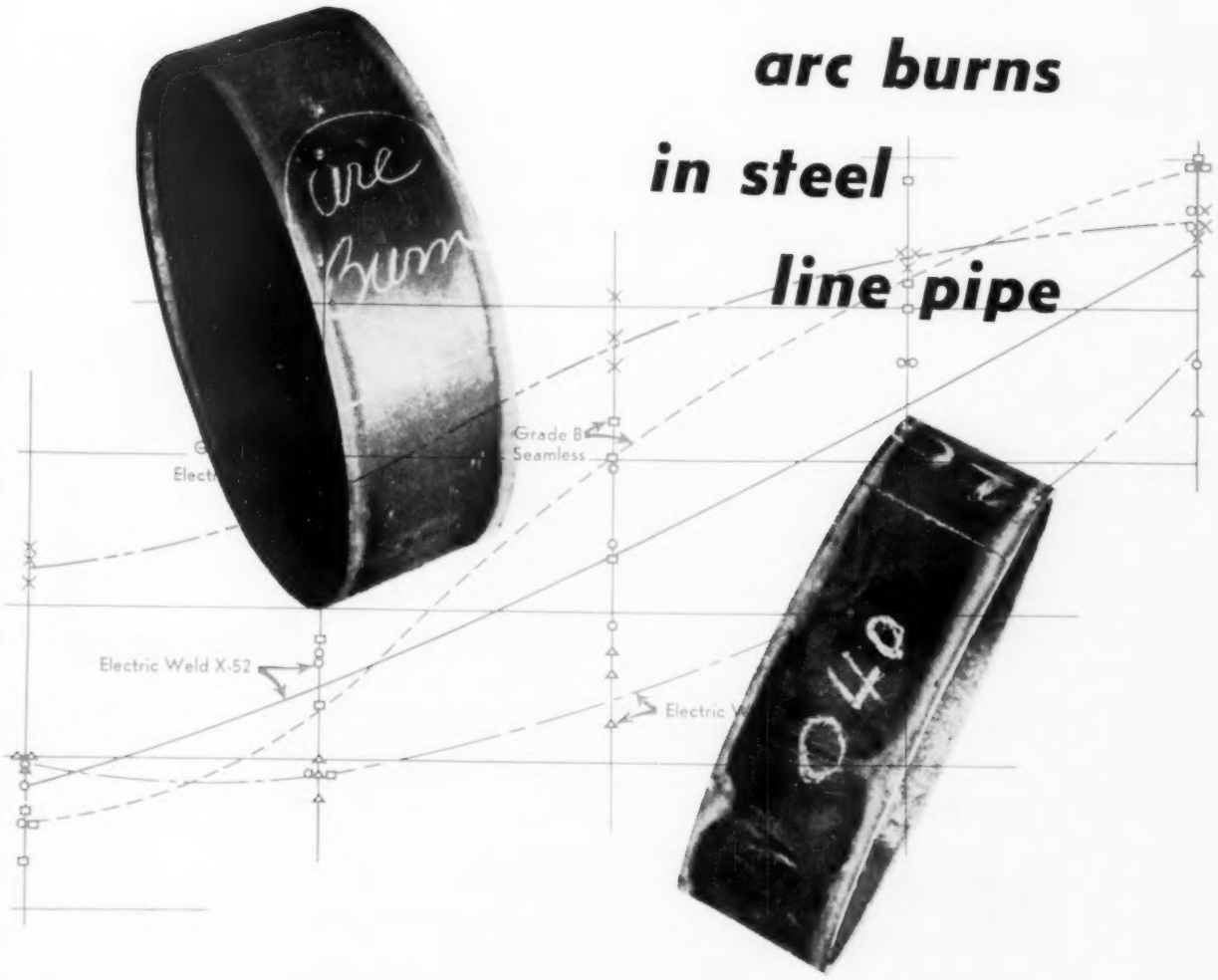
TRANSMISSION • STORAGE • CONDITIONING

GAS

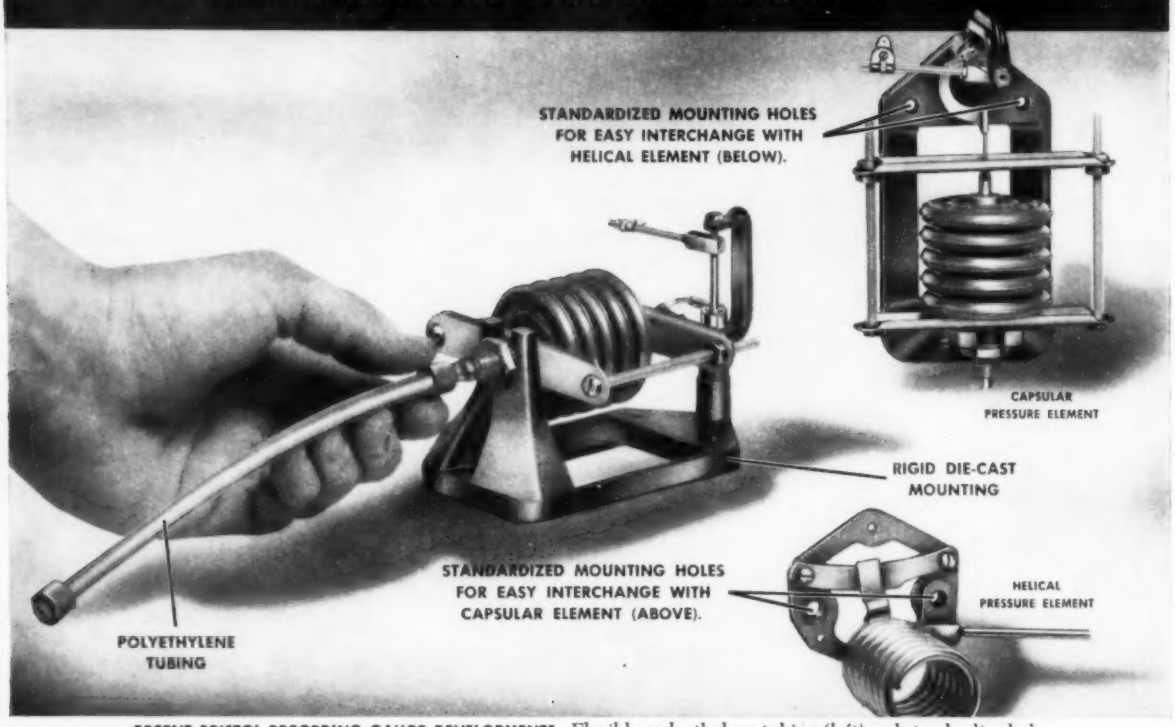
PIPELINE SECTION

ENGINEERING • CONSTRUCTION • MAINTENANCE

Gouges and arc burns in steel line pipe



WHAT'S NEW IN RECORDING GAUGES AT BRISTOL...


STANDARDIZED MOUNTING HOLES FOR EASY INTERCHANGE WITH HELICAL ELEMENT (BELOW).
CAPSULAR PRESSURE ELEMENT
RIGID DIE-CAST MOUNTING
STANDARDIZED MOUNTING HOLES FOR EASY INTERCHANGE WITH CAPSULAR ELEMENT (ABOVE).
HELICAL PRESSURE ELEMENT
POLYETHYLENE TUBING

RECENT BRISTOL RECORDING GAUGE DEVELOPMENTS. Flexible polyethylene tubing *(left)* and standardized element mountings simplify element interchange, provide increased mounting rigidity and vibration isolation.

Why are more Bristol Recording Gauges used than all others combined?

A key reason for this preference: *Bristol Pressure Measuring Elements.* They're the result of more than 68 years of practical experience. *And field reports show that our recording gauges, equipped with these famed measuring elements have been in constant service for up to 40 years! An outstanding record for long life and stability!*

Another reason. Our continuous development program, aimed at keeping Bristol Recording Gauges far in advance of today's needs. The latest results of this program are now available in Bristol Recording Gauges:

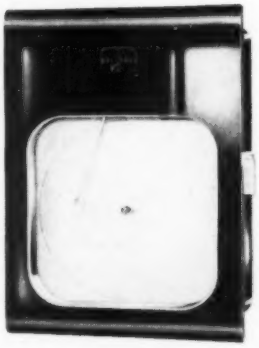
Easy-change elements. Element mountings have been redesigned to insure interchangeability of elements. You can buy a pressure gauge with any standard helical element and change later to any standard capsular type element, or *vice versa.*

Extra mounting rigidity. Rigid cast-aluminum element mounting assures greater accuracy, stability and reliability.

Flexible polyethylene tubing used to connect measuring elements. Simplifies interchange of elements, simplifies maintenance. Isolates element from shock and vibration.

Improved element materials. Capsular measuring elements are now available in stainless steel and Ni-Span C, as well as phosphor bronze. As a result, this type of measuring element, ideal for low pressures, can now be used for a large number of corrosive fluids. Helical elements are now available in Ni-Span C, too.

Find out more about these latest Bristol gauges for recording, automatic control, pneumatic transmission and telemetering. Send for our 32-page catalog G621, today. The Bristol Company, 119 Bristol Road, Waterbury 20, Conn. 6.57



BIG REASON FOR USER PREFERENCE is Bristol measuring elements, unexcelled for accuracy, precision, long-term stability. **They're made in ranges from 0-6mm mercury absolute to 0-10,000 psi.**

BRISTOL *TRAIL-BLAZERS IN PROCESS AUTOMATION*

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

GAS exclusive

Gouges and arc burns in steel pipe pose a complex problem to pipeliners throughout the gas industry. The problem has been accentuated of late by the new ASA Code for gas piping. Here are the results of one company's study.

Investigation of gouges, arc burns in steel line pipe

By C. T. SCHWEITZER, Supervisor of Engineering Standards
Southern California Gas Co., Los Angeles

THE new American Standards Association code for gas transmission and distribution piping systems has focused the attention of pipeliners on the importance of gouges and arc burns in steel pipe. This code requires that all injurious gouges or grooves be removed in pipelines intended to operate over 20 per cent of the specified minimum yield strength and that arc burns shall be prevented or eliminated in pipelines of Specification 5LX if the line is intended to operate at more than 50 per cent of the minimum specified yield strength. In order to evaluate the seriousness of gouges and arc burns for methods of removing or repairing them, a series of tests were conducted.

A test that has been used for many years as a means of acceptance of welded pipe is the API 5L flattening test. In this test, a 4-in. long ring of welded pipe is placed in a press so that the weld is at the point of maximum bending as the ring is flattened. The test is considered satisfactory if no opening takes place in the weld until the distance between the parallel plates is less than two-thirds of the original diameter of the pipe. By placing the notch or gouge at the point of maximum bending and measuring the distance between the parallel plates at the time of rupturing, a comparison can be made between various depths of defects in different grades of pipe.

The requirements contained in API 5LX Specification regarding an acceptable flattening test provides a bench mark that may be used in evaluating the seriousness of grooves and arc burns. There are other factors that influence this comparison, such as length and orientation of the gouge and the effect of the gouge as a stress riser. Nevertheless, an acceptable flattening test to API 5LX standards should give an indication of what has proved to be satisfactory performance for accepting pipe.

It was decided to use 12.75-in. diameter 0.250-in. wall pipe for the flattening test rings as a convenient size for handling. Random pipe lengths were selected, including API 5L Grade B seamless, Grade B electric weld, API 5LX Grade X42 electric weld and Grade X52 expanded electric flash welded pipe. The chemical and physical properties of this pipe are shown in *Table 1.*

The pipe sections were cut into lengths of about 15 in. and placed in a shaper and scored longitudinally. For welded pipe the groove was approximately 90° from the welded seam. A dull tool was used in making the grooves, in order to

TABLE I. PHYSICAL AND CHEMICAL PROPERTIES OF PIPE SAMPLES.

	Seamless	Electric Weld		
	Grade B	Grade B	X-42	X-52
Yield strength, psi	44,383	51,366	50,000	62,096
Ultimate strength, psi	72,876	70,218	68,070	84,946
Elongation in 2 in.	30%	28%	33%	28%
Carbon	0.28%	0.28%	0.24%	0.28%
Manganese	0.53	0.74	0.60	1.13
Phosphorus	0.010	0.010	0.012	0.014
Sulfur	0.046	0.029	0.024	0.026

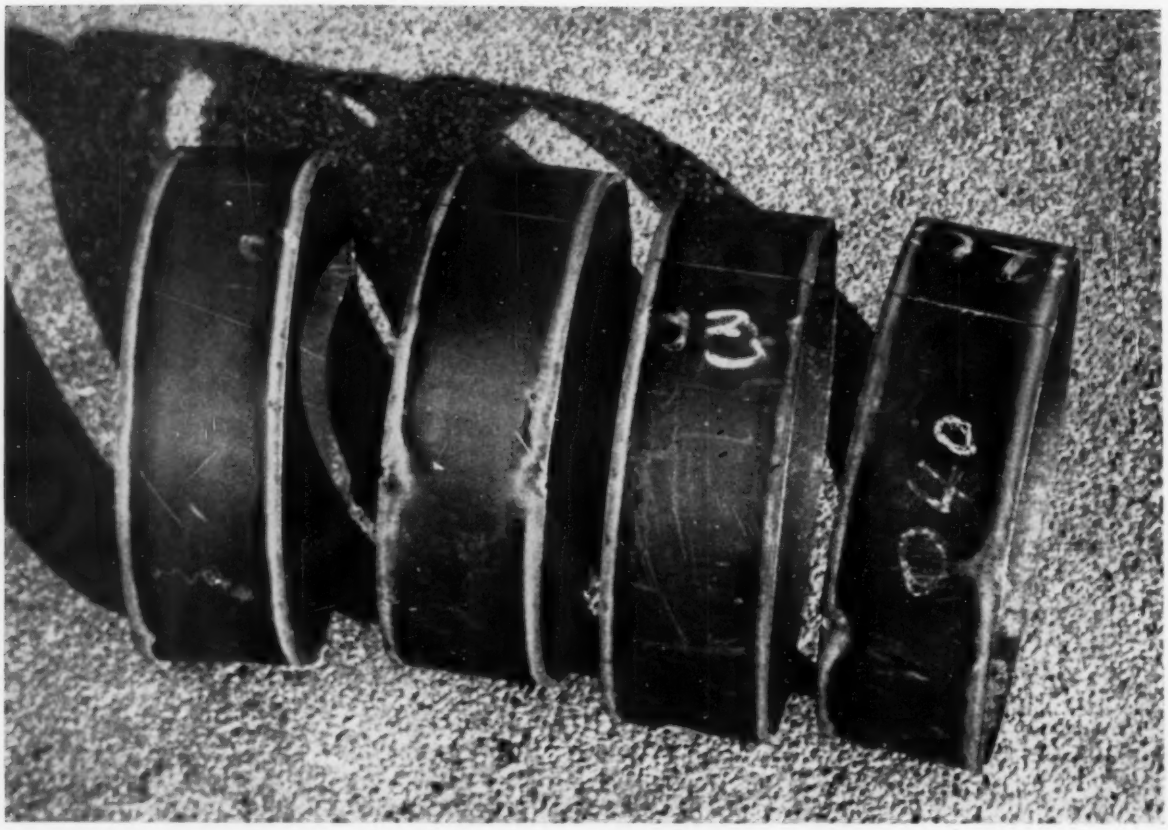


Fig. 1. Photograph of 12.75-in. diameter test rings showing machined gauges near top of pipe.

produce a rough surface that is more representative of the damage usually experienced in the field. The grooves were machined to represent five different depths: .010-in., .020-in., .030-in., .040-in. and .050-in. Three test specimens were made for each depth of groove. (*See Fig. 1.*)

After the grooves were machined, the pipe ring specimens were flame cut to 4-in. lengths; the ends of the specimens were slightly ground to remove sharp edges. The samples were placed in an ice bath to obtain a testing temperature close to 32°F. The rings were flattened in a Tinius Olson Universal testing machine between parallel plates at a speed of 10 in. per minute. Careful observation was made at the groove. The flattening was stopped at the first indication of rupture at the groove and the distance between the parallel plates was measured.

The results of the tests on rings containing the machined grooves, which involved 60 individual specimens, are shown in *Fig. 2*. The variation between the results of test specimens having the same depth of gouge was usually small; however, there was a difference between the results of the various grades of pipe. This variation appeared to be less as the grooves approached or were over .040 in. deep. The tests on Grade B pipe show a transition in the curve between .020 in. and .030 in., which did not occur in the higher grades of pipe. The results did not show that the grades of pipe with lower specified yield strength had any more resistance to failure from gouges than pipe of higher physical properties. The only difference that was noted during testing was that the samples of X52 pipe ruptured with a sharp noise, which probably had something to do with the speed of fracture, while the other specimens failed without any appreciable noise.

To determine the effect of grinding out the groove, one specimen of X42 grade pipe, containing a .060-in. groove, was filed flat to remove the groove. This specimen was flattened, as far as the testing machine would allow, without failure.

Specimens were also prepared to indicate the effect of repair welds. Test rings were flame gouged in a longitudinal direction for about 3 in. and to a depth of ⅛ in. Before these gouges were repaired, the pipe specimens were put in an ice bath to lower the temperature. Immediately on removal from the ice bath and drying, repair welds were made with a 5/32-in. electrode (E-6010) in two passes, without preheating, in order to simulate severe welding conditions.

The repair welds were ground flush with the pipe wall by using an air-driven grinder similar to what is used in the field. The repair welds, although sound, contained slight undercutting along the edges. These test specimens were flattened between parallel plates with the repair weld at the point of maximum bending.

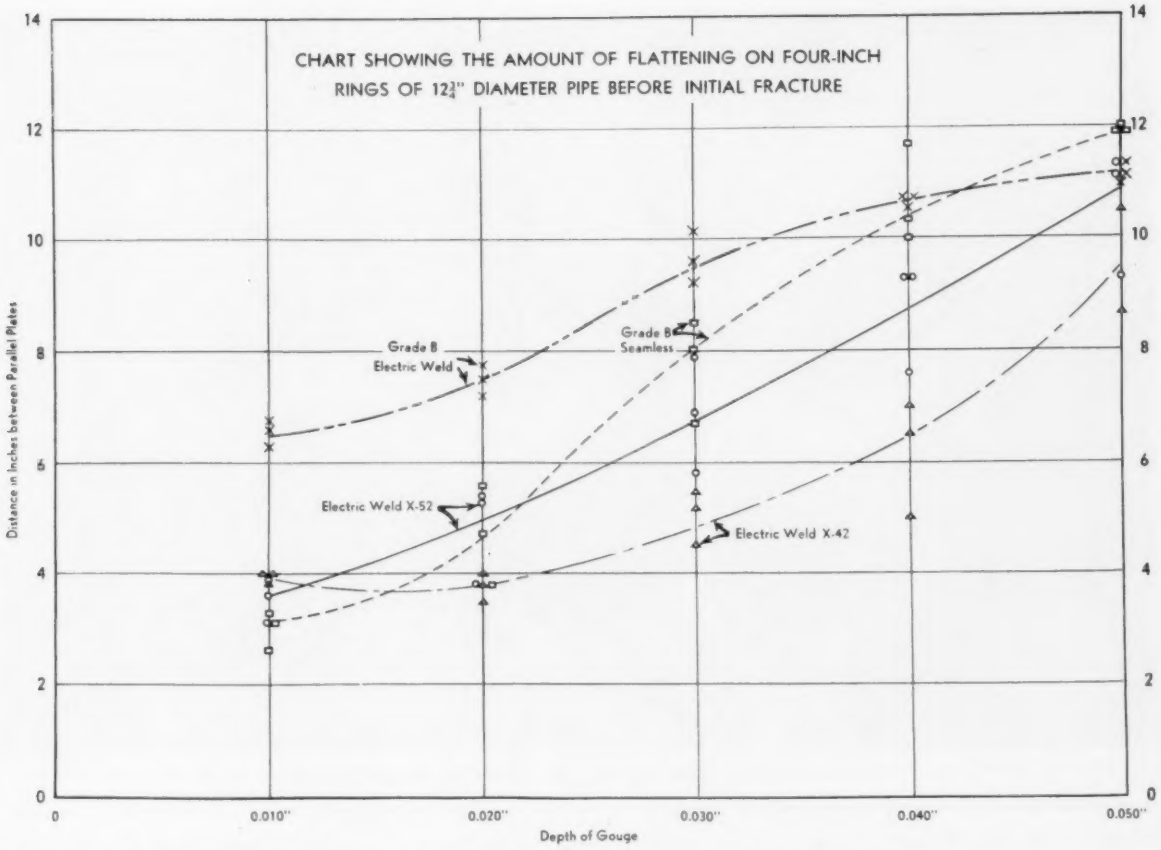


Fig. 2. Chart showing the amount of flattening on 4-in. rings of 12.75-in. diameter pipe before initial fracture.

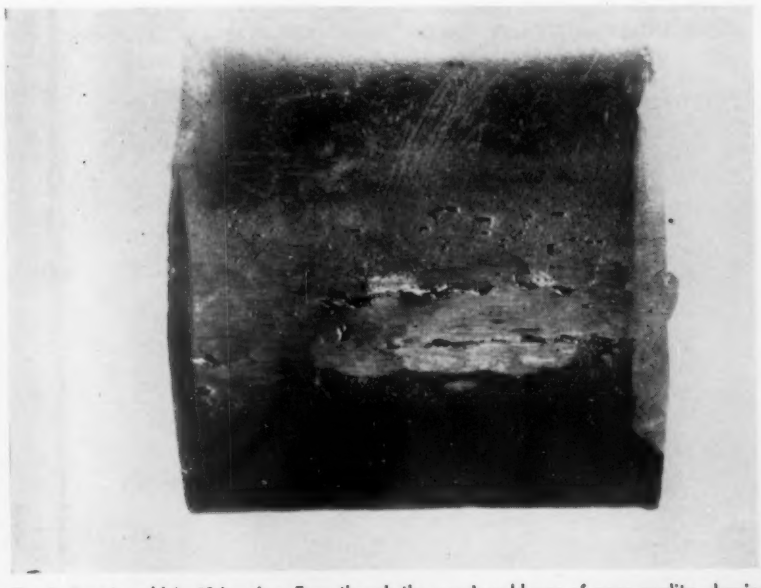


Fig. 3. Repair weld in 12-in. pipe. Even though the repair weld was of poor quality, showing considerable undercutting, the specimen was flattened to within approximately 2.5 in. without signs of failure.

The results of three different grades of pipe were all fairly consistent and showed that the effect of the repair weld was about the same as for a gouge .010 in. deep. This was rather surprising due to the presence of undercutting on the repair weld (*Fig. 3*).

A series of arc burns were made on specimens of 12-in. pipe and the pipe was flattened until failure was observed in the arc spot (*Fig. 4*). Generally speaking, the arc spots would crack with about the same amount of flattening as would cause a .030-in. gouge to fail. Even though cracking would occur in the arc burn, the failure did not progress across the entire specimen even when the specimen was flattened to the limits of the machine (*Fig. 5*). Testing of these specimens was also done at approximately 32°F.

Two specimens containing arc burns were ground to remove all visible indications of the arc burns. These specimens were flattened and a crack developed in each arc burn location (*Fig. 6*). The cracks

Fig. 4. Photograph of 12.75-in. diameter test rings containing one, two, and three arc burns.

started with less flattening than most of the test specimens where the arc burns were not ground. This difference may be explained because it was easier to observe initial cracking on the smooth surface of the ground spot than in an arc spot that was not ground. One specimen containing an arc spot was normalized and no failure occurred during flattening. The results of the flattening test on repair welds and arc burns are shown in *Fig. 7.*

In order to determine the stresses in the outside fiber of the pipe at the point of maximum bending, a Baldwin SR-4 strain gauge was applied to the surface of a 12.75-in. O.D. .250-in. wall test ring of pipe. The testing machine was lowered in increments of .25 in. and strain gauge readings were taken. The limit of the strain gauge was reached when the distance between the crossheads became less than 11 in., and a second experiment was

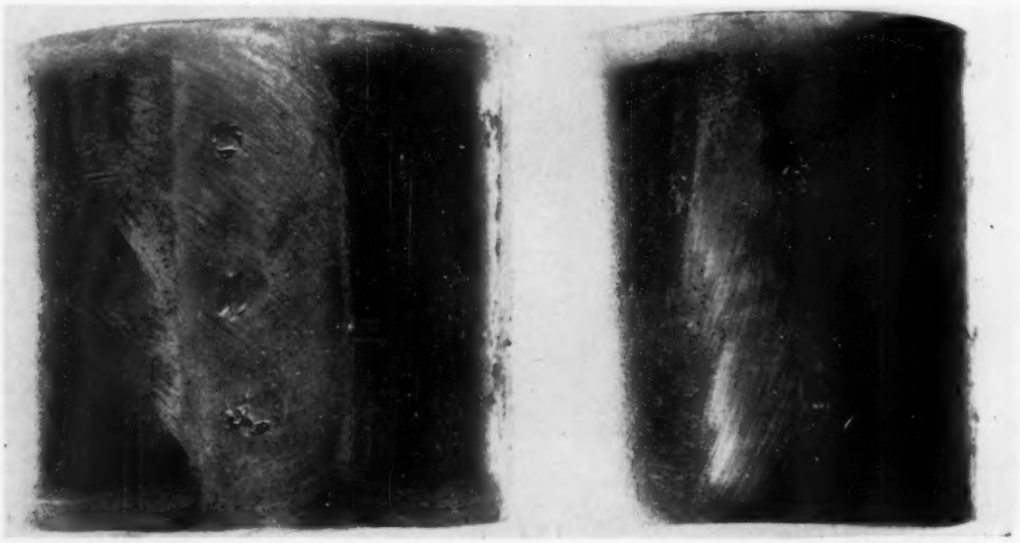


Fig. 5. Photograph of cracks in arc burns in flattened test rings of 12.75-in. pipe containing two and three arc burns.

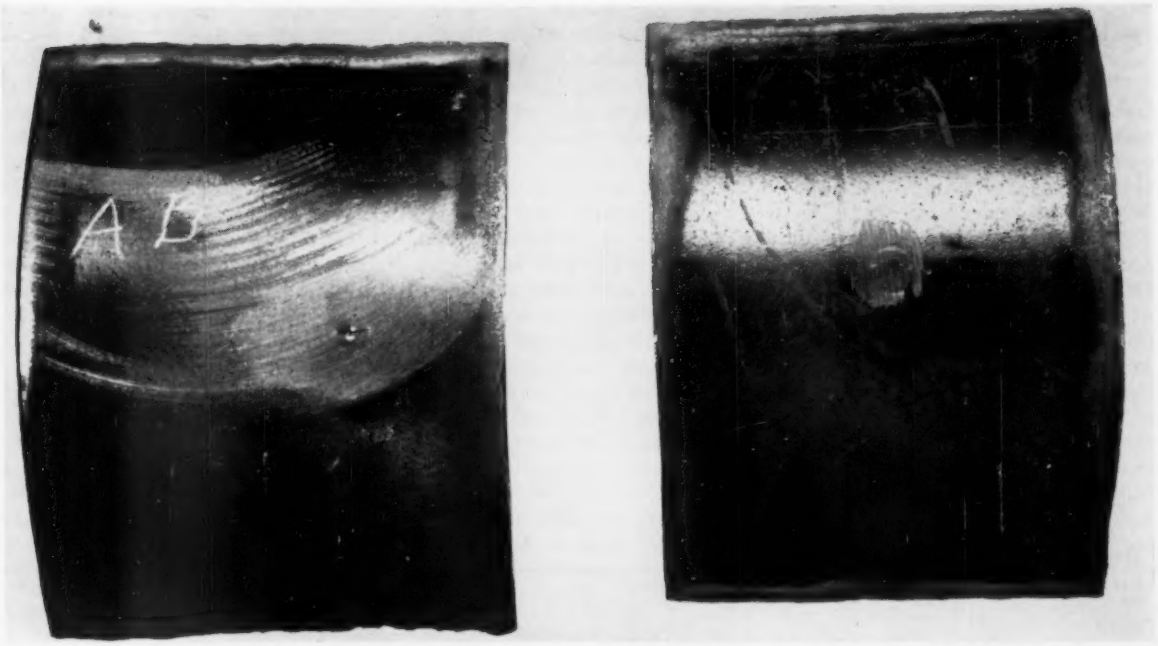


Fig. 6. Photograph showing cracks in arc burns in flattened test rings of 12.75-in. diameter pipe. These samples were ground to remove all visible indications of arc craters before flattening.

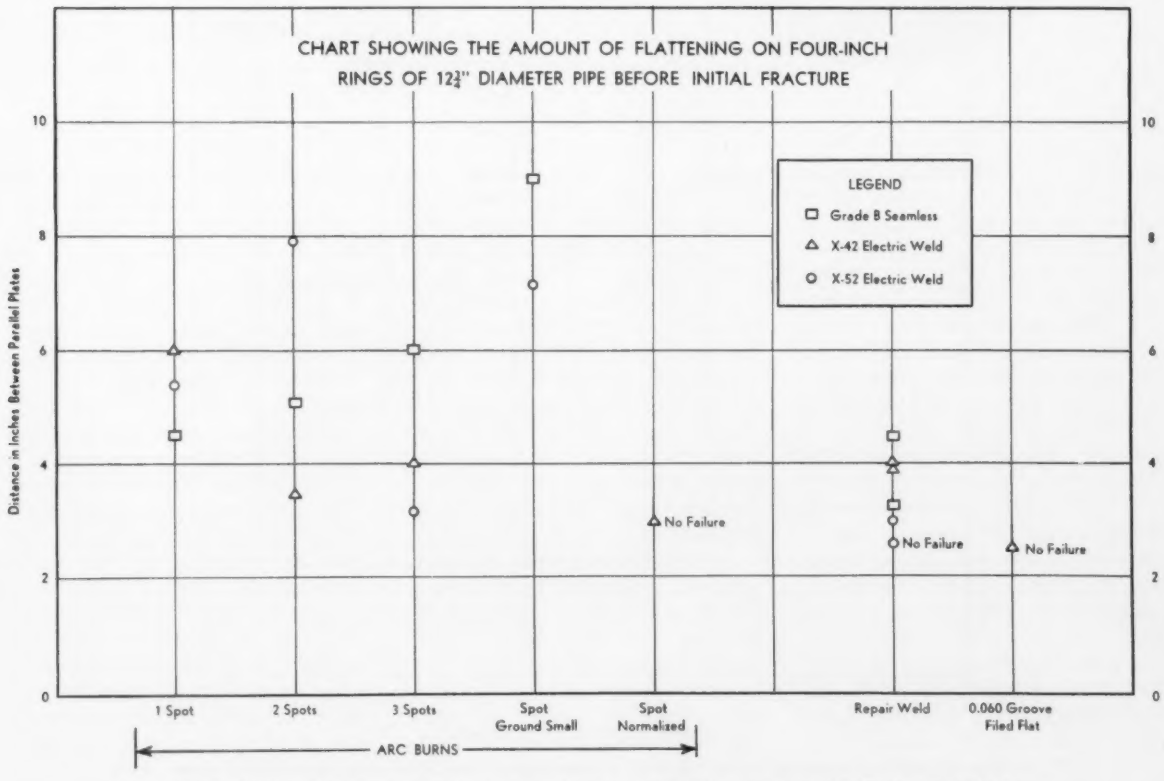


Fig. 7. Chart showing the amount of flattening on 4-in. rings of 12.75-in. diameter pipe before initial fracture.

made by scribing a 1-in. gauge length at the point of maximum bending and measuring the change in length by the use of a flexible steel rule graduated to .01 in. and making readings with the use of a magnifying glass. The results of the strain gauge measurement and direct measurement are plotted on *Fig. 8*. The calculated minimum specified yield strength for this Grade X42 pipe occurred at a strain of 1400 micro-inches per inch. This indicates that flattening the 12.75-in. OD pipe only ½ in. caused a tensile stress equal to the yield strength at the outside fiber at the point of maximum bending. Although there is considerable strain at this point, failure occurs only when there is a stress riser, such as a gouge or arc burn to trigger the fracture.

The investigation of gouges and arc burns in steel pipe is a complex problem because of the many variables, including properties of the material, conditions of stress, dimensions and orientation of the defect.

The tests in this investigation indicate the relative performance of 4-in. rings of 12.75-in. diameter ¼-in. wall pipe of different grades containing arc burns and gouges of various depths to resistance of failure from flattening. Arc burns caused cracks in all grades of pipe after flattening of between 30 to 75 per cent. However, the cracks did not cause the test rings to fail even after continual flattening. Grinding out the surface indication of the arc burn did not prevent cracking upon flattening of the ring. Normalizing the area of the arc burn eliminated cracking during flattening. Gouges caused failure in all cases with varying amounts of flattening. The depth of gouge has the over-all influence on the resistance to flattening. However, considerable variation in performance is evident between different grades of pipe, although no correlation could be made. Eliminating the gouge by filing or repairing by welding greatly increased the resistance to failure due to flattening.

Applying the API acceptance standard for the flattening test of welded pipe to the tests in this investigation indicates that most arc burns, gouges of less than .025-in., and repair welds would meet the standards. ■

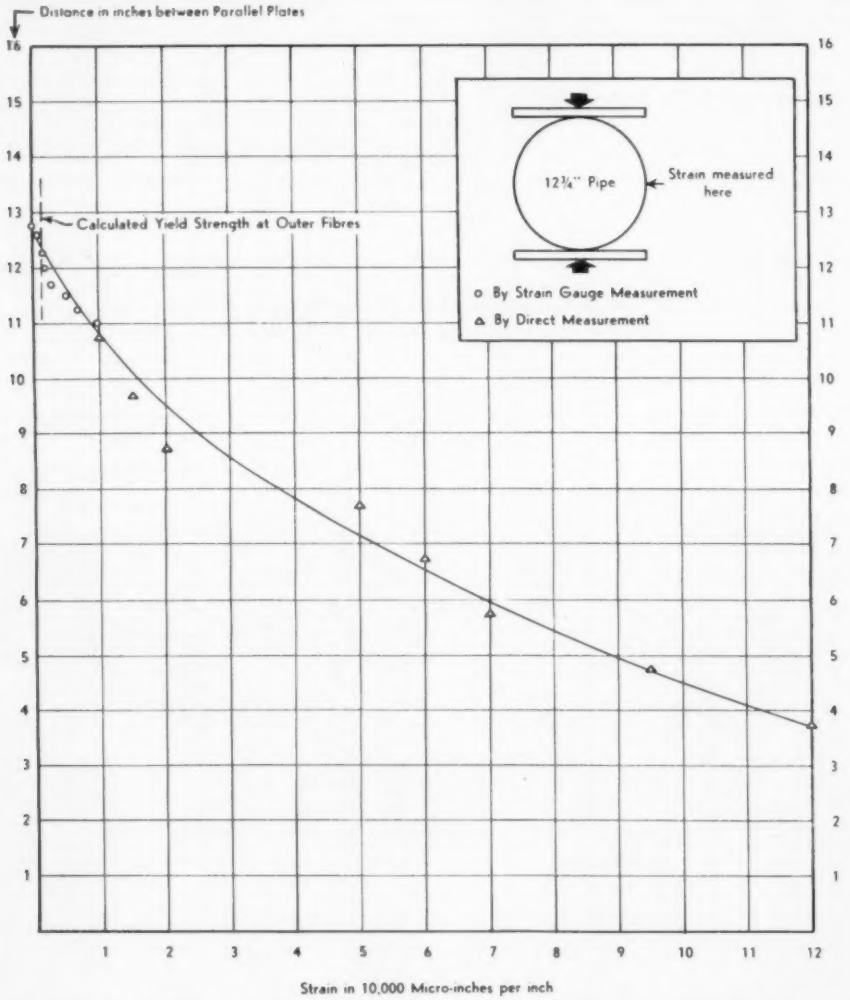
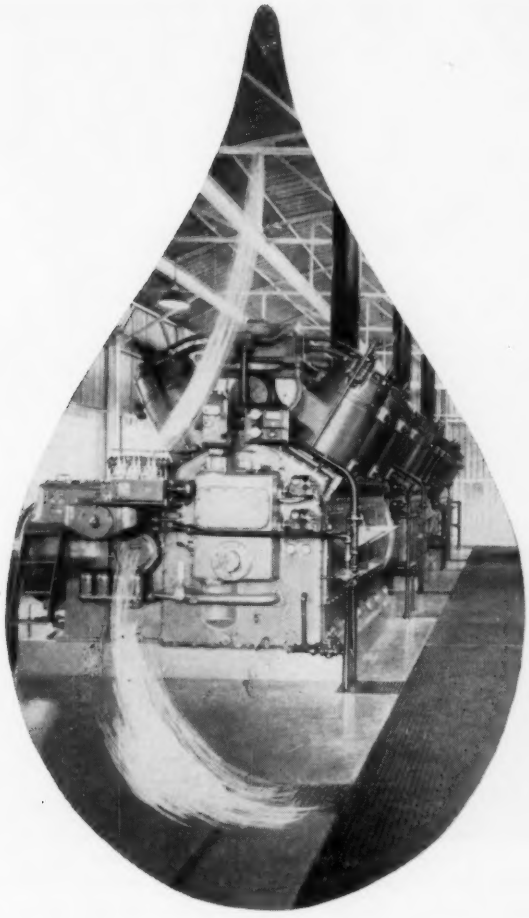

Distance in inches between Parallel Plates
Calculated Yield Strength at Outer Fibres
12¾" Pipe
Strain measured here
o By Strain Gauge Measurement
Δ By Direct Measurement
Strain in 10,000 Micro-inches per inch

Fig. 8. Results of flattening test on 12.75-in. diameter pipe. Curve shows strain at point 90° from parallel plate.

Maintenance of compressor engines by lubricating oil analysis



By DUANE V. KNIEBES,
Institute of Gas Technology, Chicago

THE ability of lubricating oil to indicate rate of wear on moving parts has been utilized by the railroad industry for several years. Much information has already been published (*Ref. 1, 2, 3, 4*) concerning development of analytical techniques and correlation of wear in diesel engines with the trace metal content of the lubricating oil in use. The amount and type of metal contained in the oil has proved to be a reliable indicator of abnormal wear in particular sections of an engine and occasionally of specific engine components. This method of detecting excessive wear prior to engine failure has been so successful that many railroads have installed analytical facilities and are using this tool for routine preventive maintenance on their diesel engines.

A research project designed to study the value of this technique for pipeline compressor engine maintenance was initiated in 1955 at the Institute of Gas Technology by the pipeline research committee of the American Gas Association. This article is a report of the results obtained during a one-year period in which monthly analyses were made of lubricating oil samples from 69 engines in service on the transmission lines of 11 pipeline companies.

At one-month intervals, 80 grams of lubricating oil were removed from each engine at a point ahead of the oil filter while the engine was in equilibrium operation. The samples were then submitted to the Institute of Gas Technology for analysis. A report giving such information as hours of engine operation since the previous oil sample, time of oil and oil filter changes, and any unusual maintenance performed on the engine was submitted with each sample. Reports were supplemented where possible by wear measurements on the bearings and cylinders. At the institute the oil samples were analyzed on the emission spectrograph (*Fig. 1*) by the rotating platform technique (*Ref. 5*), and their neutralization numbers and pentane insoluble contents determined. The spectrographic analysis measured the concentrations in parts per million of the following elements: silicon, iron, chromium, aluminum, copper, lead and tin.

The accuracy of an emission spectrographic analysis of this type is about ±10 per cent of the amount present for each component. Concentrations of less than 10 PPM can be determined to about ±1 PPM. Much larger errors can occur if the sample analyzed is not representative of the whole crankcase oil. Since only 10 drops of oil are actually analyzed, it is impera-

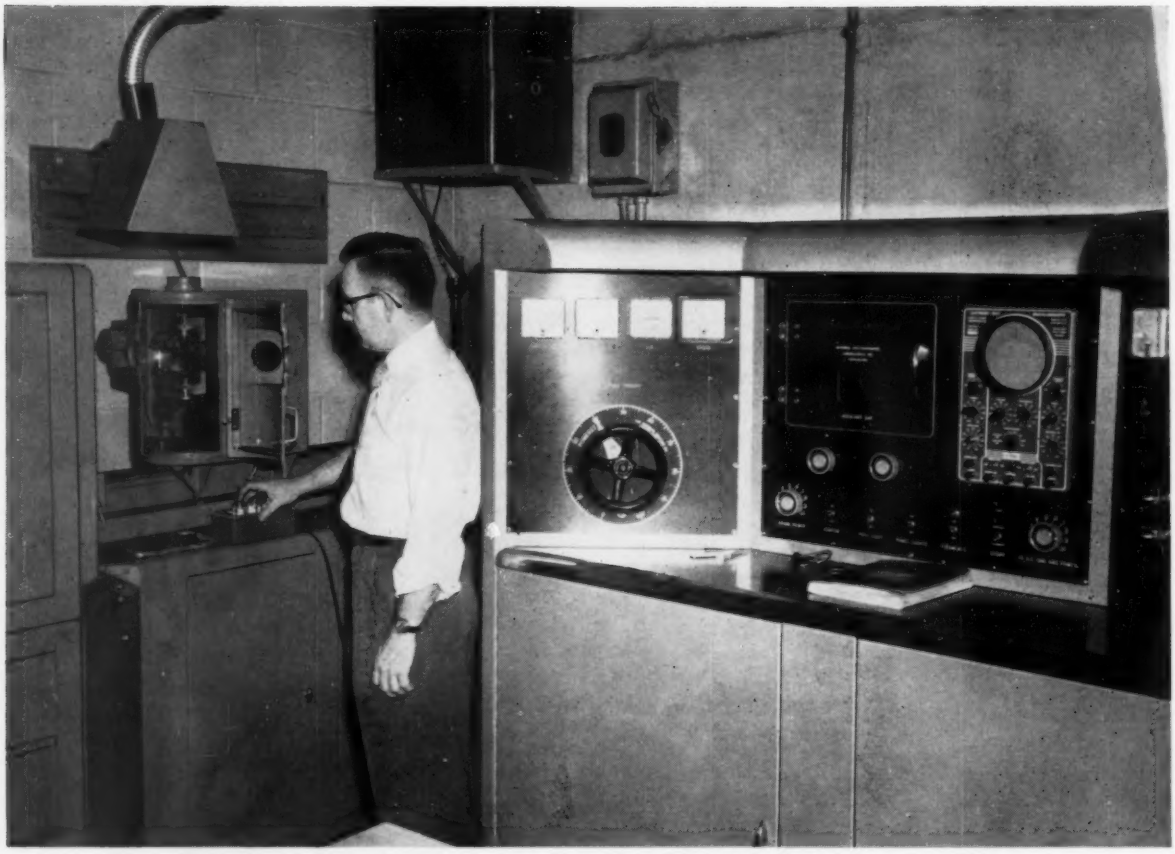


Fig. 1. Three meter grating spectrograph at the Institute of Gas Technology laboratory in Chicago.

tive that the sample be kept thoroughly mixed and free of contamination. Unfortunately, the most careful precautions will not prevent occasional particles of dust, metal or engine sludge from getting into the final 10 drops of sample. For this reason a series of analyses is necessary to establish with confidence a normal oil analysis for each engine. A new sample which deviates significantly from this analysis should be rechecked in the laboratory. The engine should then be resampled to obtain a confirming analysis before conclusions regarding wear rates in the engine are drawn.

Proper interpretation of the analytical data requires each engine to be treated individually. Since bearing, ring, piston and cylinder metals will vary among engines, the major composition of the surfaces subject to wear must be known so that the metal found in the lube oil can be related to the surface which is wearing. The seven elements determined are generally useful to indicate the following types of wear.

Silicon is used as a measure of dirt in the oil. It will normally indicate a malfunctioning air cleaner.

Iron is used as a measure of wear rate in cylinders and liners, and as an indication of the general corrosion occurring in the engine.

Chromium is used to indicate wear on chromium-plated rings and liners and to detect the presence of chromate-treated water in the crankcase.

Aluminum, copper, lead and *tin* are used to detect wear on bearing surfaces. A number of pipeline compressor engines are now using aluminum bearings, and the conventional steel-backed babbitt bearings contain various amounts of copper, lead and tin.

The 69 engines tested in this program consisted of 17 engine models from five manufacturers. Twenty-eight grades of oil representing the products of 10 refiners were in use. The engines were located in compressor stations in 13 states roughly bounded by Texas, Arizona, Nebraska, Illinois and Virginia.

The large number of variables present in this study would indicate that general correlations would be very difficult; however, 30 of the 54 engines which used non-detergent oil during the test period can be included in a single category. Contaminant concentrations in oils from these engines did not exceed the following limits throughout the test period:

Silicon	4 PPM
Iron	10 PPM
Chromium	1 PPM
Aluminum	2 PPM
Copper	2 PPM
Lead	2 PPM
Tin	2 PPM

None of the engines in this category reported any unusual maintenance due to excessive wear. Since this group of engines is representative of the majority as to manufacturer, model, and oil used, it may be possible to set up recommended specifications for maximum allowable contaminant concentra-

Compressor Station at Clarksdale, Miss. and Dispatching and Dehydration Station at Eunice, La., which are among those interconnected by RCA Microwave System

Texas Gas Transmission Corp. Installing 32-Channel RCA Microwave System

RCA Microwave Network Provides 32 Voice Channels Expandable to 60 Channels in 700-Mile System

Texas Gas is currently installing an RCA CW-20A Microwave communication system. The initial 32 channels will include dispatching and operational party lines, private lines to each compressor station, and a mobile radio control circuit to connect 118 mobile radio units.

Twenty-three compressor stations, plus field offices in Kentucky, Tennessee, Mississippi, Arkansas and Louisiana, will be provided with dependable integrated communications facilities.

The new microwave network will tie switchboard facilities at Guthrie and Owensboro to all other system points and provide instantaneous service between any two locations. Installation is on a turnkey basis by RCA which is also training Texas Gas personnel in operation and maintenance.

Further particulars on the use of dependable RCA Microwave in utilities, pipelines, offshore drilling, turnpike and other applications will be mailed on request. RCA Microwave specialists are experience-qualified to answer your questions and help plan your installation.

RCA MICROWAVE RADIO . . . *performance-proved in more than a million channel miles of operating systems throughout the world.*

RCA Tmk(s) ®

RADIO CORPORATION of AMERICA

COMMUNICATIONS PRODUCTS
CAMDEN, N. J.

In Canada: RCA VICTOR Company Limited, Montreal

Radio Corporation of America
Communications Products
Dept. T-180, Building 15-1, Camden, N.J.

☐ Please send me latest literature on RCA Microwave.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

☐ Have RCA Representative get in touch with me.

tion in the non-detergent lube oils of engines in gas compressor service. There will, of course, be some exceptions due to differences in oil filtration techniques and frequency of oil changes, but even these tolerances appear to be very broad.

It is interesting to note that the iron content in the oils from normally operating engines tends to rise during the winter months and then fall during and spring and summer. This is apparently due to the higher engine loading which occurs during the winter and indicates an increase in ring and cylinder wear during the high load periods.

Fig. 2 shows the average monthly iron content of the oils from the 30 normal engines. It ranges from a low of 2 PPM in August to a high of 7 PPM in January. The ratio of winter to summer iron content of these oils is shown in *Fig. 3*. This ratio ranges from 1.4 to 1 to 4.5 to 1 and averages 3 to 1. Although many factors can affect this ratio for an individual engine, it may be possible in the future to utilize this normal winter-to-summer wear rate ratio to assign limits on the use of iron content in an oil before abnormal wear is suspected.

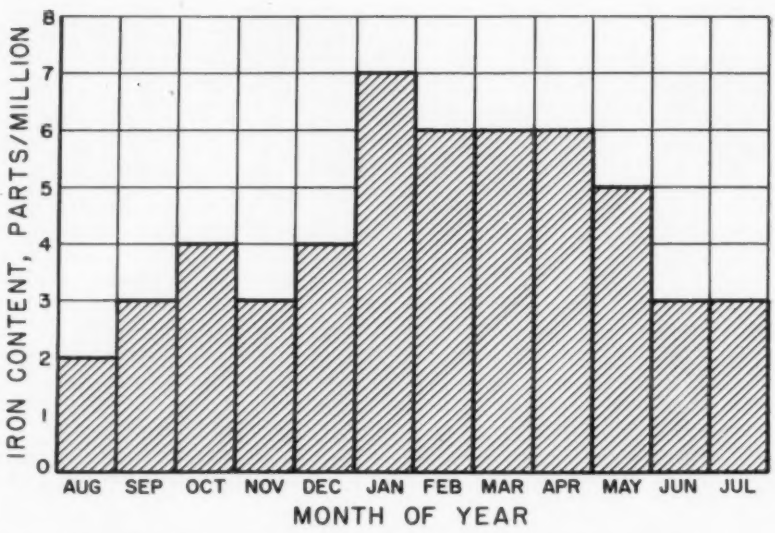


Fig. 2. Average iron content of lubricating oil for 30 engines in normal operation.

Although the above contaminant concentration limits may be useful for determining if an engine is exceeding a reasonable normal rate of wear, it cannot necessarily be used to indicate incipient failure of engine components. A significant and consistent increase in concentration level of one or more elements in the oil must be present before excessive wear which will lead to failure is suspected. The oils from several engines in this study contained higher iron and lead levels than did the 30 engines used to establish the normal limits. Although this may have indicated greater ring and bearing wear than should be present in these engines,

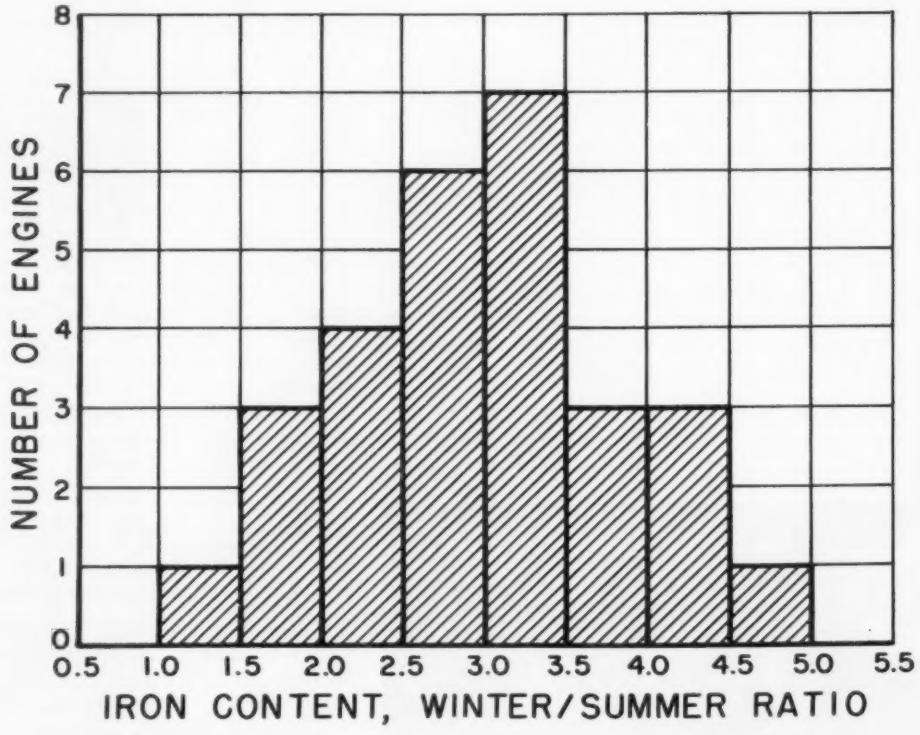
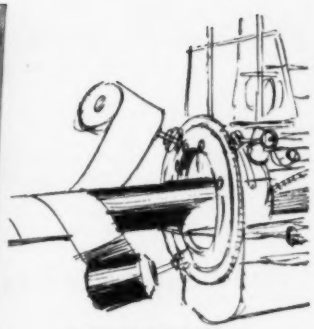
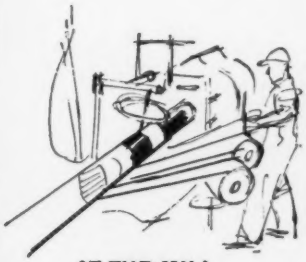


Fig. 3. Winter to summer ratio of iron content of lubricating oil for 30 engines in normal operation.



BY TRAVELINER

BY HAND



AT THE MILL

UP-TO-DATE INFORMATION ON PIPELINE PROTECTION ...NEW NO-OX-ID CATALOG

Dearborn has compiled a new 12-page illustrated catalog describing the latest approved methods of coating and wrapping underground or underwater pipe for long-term protection. Every pipeline contractor, utility and private operator will want a reference copy.

The catalog describes NO-OX-ID compounds and NO-OX-IDized Wrapper combinations developed for corrosion control under all soil conditions. It tells how to apply NO-OX-IDs, hot or cold, by Traveliner, by hand or at the mill...how to get more pipe coverage with less equipment and smaller coating crews.

It pays to specify

Dearborn® NO-OX-ID

Specify NO-OX-ID combinations for long-term protection

Your copy is ready

Just fill out the coupon and mail...we will send your catalog promptly. Please indicate the number required for staff use. If you prefer, we will have a Dearborn Pipeline Engineer deliver the catalog when he makes his consultation call.

Dearborn Chemical Company
Merchandise Mart Plaza, Dept. GG, Chicago 54, Ill.

☐ Send me ..... (quantity) new Dearborn NO-OX-ID catalogs.

☐ Have a Dearborn Pipeline Engineer call with my copy.

Name.....*Title*.....

Company.....

Address.....

City.....*Zone*....*State*.....

TABLE 1. ENGINES USING DETERGENT OILS.

Group	Number of Engines	Types of Detergent Oil Used	Remarks
1	6	3	New oils contained trace elements normally determined. Oils from engines contained high levels of contaminants which prevented interpretation.
2	2	1	New oil contained no trace elements normally determined. Oil with 6000 hr life behaved like Group 1 oils. Oil with 36,000 hr life behaved like Group 3 oils.
3	7	5	New oil contained no trace elements normally determined. Oils in use appeared similar to non-detergent oils.

TABLE 2. ANALYSES OF GROUP 2 DETERGENT OIL IN TWO ENGINES OF SAME MAKE.

	Engine A	Engine B
Date	May, 1956	May, 1956
Neutralization No.	0.4	1.5
Silicon	2	4
Iron	14	61
Chromium	P-1	P-1
Aluminum	2	2
Copper	5	50
Lead	1	35
Tin	1	8
Engine hours on oil	37,000	6,000

it was apparently an equilibrium condition and could not be interpreted as an indication of imminent failure of any components. Much more analytical data and engine wear measurements must be obtained before reliable predictions can be made concerning the wear rates in engines which fall into this category.

A number of situations can occur which invalidate all or a portion of the analytical data for purposes of wear rate determination. For example, four of the engines in the program were of the old horizontal type with open oil sumps. Airborne contaminants can, therefore, enter the oil and produce high and erratic concentrations of contaminants, thereby making this type of engine unsuitable for a study of this kind. In addition, the lead content of the oils from a number of engines could not be used as an indicator of wear since lead containing sealing compounds was used on inspection doors in contact with the crankcase oils. As a result of the lead being leached from the sealing compounds, the lead content of these oils would vary from 10 to 100 parts per million, thereby masking any lead which may have come from bearings.

Oil changes will, of course, upset the equilibrium between the oil and the engine and from 200 to 1000 hours of operation are normally required before the contaminant level of the oil returns to its proper value. If abnormal wear is taking place, however, the concentration of the appropriate metal in the oil will usually increase rapidly enough to cause suspicion rather quickly. Oil filter changes affect the oil in a similar, but not so substantial manner.

Fifteen engines in this study used detergent oils. Nine types of oil from seven refiners were represented. The engines and oils can be conveniently divided into three groups as shown in *Table 1*.

Only the Group 1 oils contained additives partially composed of one or more elements normally determined as wear metals in crankcase oils. The detergent properties of these oils also retained high levels of engine wear metals suspended in the oil. Their use as indicators of abnormal wear rates was, therefore, prevented, since low order wear trends were masked by the high and erratic normal contaminant levels.

The Group 3 oils did not show the same high detergency properties, since the crankcase oil of the engines in which they were used contained essentially the same contaminant levels as non-detergent oils. Two instances occurred in this group of engines in which abnormal wear was predicted by the analytical data and was confirmed by engine inspection. Evidently the use of these types of detergent oils is not detrimental to the value of this method of wear rate measurement.

The detergent oil used in the engines of Group 2 produces, when new, the same high contaminant levels as the Group 1 oils, although none of the trace elements determined are found in the new oil. After long use in the engine, however, the detergent properties of this oil disappear. Typical analyses of this oil in two engines of the same make are shown in *Table 2*.

An example of the usefulness of this method in anticipating maintenance is shown in *Table 3* which lists the analyses of monthly samples of lubricating oil from an engine which required replacement of several rings and a main bearing half in February 1956. The rise in iron content of the oil in November was not considered abnormal because of the higher engine load which occurs during the winter months. The December and January samples showed a much higher rise in iron content than would be expected. In addition, the January sample showed an increase in silicon which would indicate the presence of dirt, and increases in lead, tin and copper indicating increased bearing wear. The sample taken in February, when repair was necessary, showed the highest iron and tin content of the series. After repairs had been made, the impurity concentration dropped to normal during the next few months. This reduction in impurity content would have taken place much more rapidly if the oil had been well filtered or changed after repairs had been made.

Another example of the detection of impending bearing failure is shown in *Table 4*. This engine performed normally from an operat-

Youngstown's "big 5"

MEAN ELECTRIC WELD LINE PIPE PROVEN AND READY FOR OIL AND GAS PRODUCING AREAS

Here are the "Big 5" reasons why Youngstown Electric Weld Line Pipe is your best buy:

1. It bends readily
2. Wall thickness is uniform
3. Line up characteristics are excellent
4. Weldability is outstanding
5. Long lengths save you time and trouble

In the process of producing Youngstown Electric Weld Line Pipe, every means is explored to assure uniform wall thickness. Uniformity of wall in the pipe begins with control of the skelp thickness produced on the rolling mill. The experience plus control in the rolling of the skelp by men who know steel makes this uniformity possible. Youngstown as an integrated producer has full control over the skelp rolling as well as the finished pipe production. To test the uniformity and quality, the pipe is then placed in a hydrostatic testing machine where internal pressure is applied. To obtain Electric Weld line pipe of uniform wall thickness—specify Youngstown Electric Weld line pipe for your next pipe line job.

Youngstown maintains sales and service offices throughout the oil and gas producing country—see your area representative soon.

Youngstown Electric Weld Line Pipe

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices - Youngstown 1, Ohio

District Sales Offices in Principal Cities

Foxboro Flow Meters get "sea-duty" measuring gas flow on platform in Gulf of Mexico. Well pressure is 1900 lbs.; pressure upsteam from chokes 800 lbs.; meter-run pressure 500 lbs.

. . . Foxboro Flow Meters

Rugged, accurate, thoroughly dependable—whether they're measuring gas flow on an off-shore platform or on a desert! That's the field performance record of Foxboro Flow Meters . . . the reliable, economical means of charting and prorating well production.

Basic "better-design" of these Foxboro Meters *assures* accuracy with essentially no maintenance! For example, transmission of float motion to the pen is *linear* — through the exclusive segmental lever drive and "life-lubricated" anti-friction bearing. There's no calibration compromise . . . no lost motion. And these are only a few of many engineered advances that pay off in troublefree gas measurement.

There are Foxboro Flow Meters for any production service. With the longest float travel and highest power of any commercial meter, the Type 28 is ideal for metering natural and manufactured gases. The light-weight Type 22 is best-suited for portable service or for mounting directly on the piping. For complete details, write for Bulletin 7-10A.

THE FOXBORO COMPANY, 346 NORFOLK STREET, FOXBORO, MASS., U. S. A.

FOXBORO REG. U. S. PAT. OFF. Oil and Gas FLOW METERS

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

ing standpoint throughout the test year. The lubricating oil analyses, however, showed a sudden rise in tin and copper content of the oil in March, and these concentrations remained high in subsequent samples. A bearing inspection in December 1956, after the sampling program had been completed, revealed that the babbitt had been wiped from two main bearings.

Table 5 shows a series of analyses of the oil from an engine newly placed in service. The original bearings in this engine had a high copper content. The January and February analyses showed high copper levels in the oil. This fact and other considerations resulted in a decision to change the bearings in March. The replacement bearings were surfaced with lead base babbitt.

The series of analyses from March through September then showed an increasing lead content of the oil, indicating heavy wear on the bearings. A bearing inspection after the completion of the program confirmed this indication, and bearing replacements had to be made.

Several other cases of ring and bearing troubles and one case of a water leak due to a cracked cylinder head were also observed during the program. Three instances of malfunctions of air filters on engines located in dust bowl areas were also noted. In each case the filter was cleaned after receiving the analysis report and no damage occurred to the engines.

The use of periodic lubricating oil analysis appears to be of definite value as part of the preventive maintenance program on pipeline compressor engines. Additional work is still necessary, however, to obtain sufficient background to improve the reliability of wear predictions and to further define the utility of this method for engines using detergent oils. One transmission company, which has several years of continuous lube oil analyses from some of its engines, has decided to key its overhaul program at one compressor station to the interpretation of the analytical results. Instead of the present fixed schedule, the results of the used lube oil analyses will furnish one of the major criteria for a detailed inspection and possible overhaul of the engines. The experience gained by this company in the next few years from the operation of this station will be very important in determining the extent of future use of this method by the industry.

Another year of work has been undertaken to provide additional information about this technique and to complete the data on some engines whose lube oil analyses have had unexplained abnormalities.

At the conclusion of the new program we hope to have sufficient information to permit competent economic evaluation of this method by individual pipeline companies. This low cost analytical technique with proper interpretation of the data may then be able to effect considerable savings in the maintenance and overhaul costs of pipeline engines. ■

TABLE 3. SPECTROGRAPHIC ANALYSES SHOWING RING AND BEARING WEAR

Sample	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July
Date	25-55	25-55	26-55	25-56	24-56	26-56	25-56	25-56	25-56	26-56
Neut No.	0.1	0.3	0.2	0.3	0.3	0.9	1.1	0.6	0.5	0.5
Silicon	1	1	1	7	7	4	3	2	6	2
Iron	2	6	15	59	64	36	20	8	8	2
Chromium	1	P-1	P-1	P-1	P-1	P-1	P-1	P-1	P-1	P-1
Aluminum	P-1	P-1	1	1	1	1	1	1	3	1
Copper	1	1	1	3	3	3	2	2	1	1
Lead	1	1	1	2	2	2	3	1	2	P-1
Tin	1	1	1	3	4	3	4	2	4	2

Note: Element concentrations are in parts per million.
P-1 indicates less than 1 PPM.

TABLE 4. SPECTROGRAPHIC ANALYSES SHOWING BEARING WEAR

Sample	Dec.	Jan.	Feb.	Mar.	Apr.	June	July	Aug.	Sept.
Date	5-55	5-56	6-56	6-56	5-56	5-56	5-56	5-56	5-56
Neut. No.	0.2	0.3	0.5	0.5	0.1	0.7	0.4	0.5	0.5
Silicon	4	2	3	2	2	2	2	1	1
Iron	19	17	16	23	16	10	10	5	5
Chromium	P-1	P-1	P-1	P-1	P-1	P-1	P-1	P-1	P-1
Aluminum	1	1	1	1	1	2	2	1	1
Copper	8	4	P-1	6	8	7	7	6	4
Lead	3	4	3	3	2	1	2	2	8
Tin	3	2	3	21	10	27	26	11	7

Note: Element concentrations are in parts per million.
P-1 indicates less than 1 PPM.

TABLE 5. SPECTROGRAPHIC ANALYSES SHOWING BEARING WEAR

Sample	Jan.	Feb.	Mar.	May	July	July	Aug.	Sept.
Date	25-56	25-56	27-56	26-56	5-56	27-56	28-56	25-56
Neut. No.	0.5	1.3	0.3	1.5	1.4	1.9	1.6	1.9
Silicon	2	3	4	1	2	1	1	2
Iron	9	20	16	6	6	4	7	4
Chromium	P-1	P-1	P-1	P-1	P-1	P-1	P-1	P-1
Aluminum	1	1	1	2	2	1	1	1
Copper	32	27	8	6	8	5	6	2
Lead	6	9	6	7	11	16	19	26
Tin	2	2	2	P-1	1	1	1	2

Note: Element concentrations are in parts per million.
P-1 indicates less than 1 PPM.

Bibliography

1. McBrian, R., and Atchison, L. C., "Rates of Wear in Railroad Diesel Engines," SAE Journal, 58, 18-21 (1950) July; Sci. Lubrication, 2, 26 (1950) September.

2. Sennstrom, H. R., "How Spectrographic Analysis Controls Diesel Engine Maintenance," Ry. Mech. & Elec. Eng., 126, 65-68 (1952) April; Oil Engine & Gas Turbine, 20, 94-95 (1952) July.

3. "Symposium on Spectrographic Analysis of Diesel Engine Lubricating Oil," 1-76, Schenectady, N. Y.: American Locomotive Co., 1952.

4. Linnard, R. E., Threlkeid, C. B., and Blades, R. T., "Prevention of Destructive Engine Failure by Spectrographic Analysis of Crankcase Oil," Paper ASME No. 56-PET-30, Presented at ASME Petroleum Mechanical Engineering Conference, Dallas, Texas, Sept. 23-26, 1956; abstracted in Mech. Engr., 78, 1159 (1956) December.

5. Rozsa, J. T., and Zeeb, L. E., "Fast Spectro Method for Trace Determinations in Lube Oils," Petroleum Processing, 8, 1708-12 (1953) November.

This article has been adapted from a paper presented by the author at the AGA Transmission Conference May 8-10, 1957, at San Francisco.

Gas industry confident in microwave battle

By NEIL REGEIMBAL, GAS Washington Bureau

STRATEGISTS for gas and oil industry users of microwave radio facilities are bullish about their chances for blocking common carrier efforts to capture control of the ultra-high wave lengths.

As the hearings opened May 20, the gas industry, through the National Committee for Utilities Radio and the Operational Fixed Microwave Council, led off the battle.

Industrial users seeking to protect their space in the bands above 890 mc are fortified by a letter from the Justice department's antitrust division to the Federal Communications Commission.

The letter, signed by Assistant Attorney General Victor Hansen, warned that turning the operation of microwave systems over to common carriers such as the Bell Telephone system would encourage monopoly and run counter to the antitrust laws.

An FCC decision preferring common carrier operation of microwave facilities would mean the "competition would be distinctly lessened and monopoly encouraged in the manufacture, sale and use of the communications facilities adapted to this area of service," the antitrust chief said.

Congress intended in passing the Communications Act in 1934 that "competition should be relied on to regulate and develop the communications field to the greatest possible extent," he added.

"There is nothing in the Communications Act to indicate that any particular portion of the radio spectrum, such as the microwave region, should be turned over to the common carriers," the antitrust head contended.

Spokesmen for the gas and oil industry, pioneers in the microwave field, were almost gleeful about the Justice department letter.

An FCC official says that the agency has been talking with the antitrust division, and may later —probably as the hearings end— ask for the trustbusters to expand their views on the question of turning microwave over to A.T.& T. and other common carriers.

The Operational Fixed Microwave Council, an association of microwave users from a wide variety of industries formed for technical studies, was the first witness at the FCC hearings.

Second witness scheduled was the National Committee for Utilities Radio, which had listed an even dozen spokesmen. Also representing the gas and oil industry at the hearings is the American Petroleum Institute, which was scheduled to begin its presentation on June 3. The API had lined up 13 witnesses.

FCC spokesmen expect, by holding hearings on an average of three days a week, to wind up the arguments early in August. This will be followed by rebuttal evidence, and later, oral arguments on the legal controversies involved.

Spokesmen for utility users of microwave expect to argue that private users of microwave are not operating "multi-user" equipment.

"They are just talking to themselves," Joseph E. Keller, counsel for the industry says.

It would be "unthinkable" that a firm would have to hire an outsider to get that private function, just as it would to have to hire an outsider to run any other service in a business, he adds.

Trucks, tankers, or tank cars, which are under the same degree of public regulation as communications, can all be operated privately if a firm wants to, he argues.

The microwave controversy is only one of three trouble areas blossoming out at the FCC. A hearing scheduled to start this summer to review all commission rules and procedures in the lower frequency bands—25 to 890 mc—could cause trouble. And utilities are already fighting a proposal by A.T.& T. to get back into the lease-maintenance of private mobile communications systems.

At present, the "common carrier threat" isn't involved in these hearings, "but it probably will be," industry spokesmen say. There are unsubstantiated reports that the military, which already controls huge chunks of the radio bands, will make a move during these hearings to force all private radio users into the microwave bands, taking from 25 to 890 mc for their own use for guided missiles and communications.

Persons wanting to take part in these hearings must file their comments by July 1.

On the question of A.T.& T. resuming lease-maintenance of private mobile equipment, the utilities fighting the proposal again have the backing of the antitrust division.

Mr. Hansen, in another letter to the FCC, warned that it might reopen the telephone company's antitrust decree if it goes back into lease-maintenance—even with FCC approval.

The decree stipulated that A.T.& T. could not use industrial radio frequencies as a common carrier unless it was under public regulation. In order to meet the decree and get back into the field, A.T.& T. has filed a proposed tariff with the FCC to provide such service. If the FCC approves the tariff, A.T.&T. believes it will be free to go ahead and lease and maintain private mobile equipment.

But Mr. Hansen indicates he believes otherwise. In his letter, the antitrust chief said he does not consider this a "common carrier" service. He said approval of the proposed tariff "might substantially lessen the competition which now exists in the leasing as well as in the manufacture and sale, of equipment for use in private communications systems." ■

AN ENGINEERING ACHIEVEMENT BY

fish COMPANIES

HOUSTON, TEXAS

POWER FOR THE 1500-MILE PUSH...

from the prolific San Juan Basin to the gas-hungry Pacific Northwest

Construction of this Pacific Northwest Pipeline station, and the sprawling system of which it is part, posed some staggering problems—legal, financial and physical. Feasibility of the project was questioned for years. Some authorities said flatly it couldn't be done.

While the debate raged, however, the Fish Companies proved the feasibility, whipped the unique design problems, built the pipeline and helped form the utilities to take the gas. All with uncommon speed and engineering skill.

The greater scope of the Fish Companies—working together from conception to completion—can be of immense value to industries contemplating gas, oil or chemical facilities.

the fish companies

FISH ENGINEERING CORPORATION

FISH SERVICE CORPORATION

FISH NORTHWEST CONSTRUCTORS, INC.

No problems here !

Excellent weldability, plus uniformity in diameter, concentricity and end finish, make Kaiser Steel Line Pipe easy to weld in the field.

This means more pipe can be laid per day.

Next time you are ordering line pipe, specify Kaiser Steel Line Pipe.

Rely on Kaiser Steel quality and service to add dollars to your operating profits.

Kaiser Steel

VISUAL WELD INSPECTION ON PACIFIC NORTHWEST PIPELINE.

Steel Mill Products: plates • hot rolled strip and sheet • cold rolled strip and sheet • tin plate • continuous weld pipe • electric weld pipe • alloy and carbon bars • bar shapes • structural shapes semi-finished steels • pig iron • ingot molds • coke by-products • **Fabricating Division:** steel fabrication for construction, aircraft, missile and other industries • expanded fusion weld pipe reinforced concrete pipe • tanks • For specifications, write: **KAISER STEEL CORPORATION** • **Los Angeles** • **Oakland** • **Seattle** • **Portland** • **Phoenix** • **Denver** • **Tulsa** • **New York**

GAS pipeline news

Offshore deal okayed; rates under study

Following an FPC examiner's conditional authorization, the FPC issued temporary certificates authorizing four independent producers to sell gas to Tennessee Gas Transmission Co. from common sources in the Gulf of Mexico (Dockets G-11024, e al).

Called the biggest single natural gas supply contract on record, the deal calls for TGT to buy 175 MMcf/day, or four-fifths of the field's output—whichever is larger—until Nov. 1, 1958. After that, TGT must buy 1 MMcf for every 8 MMcf of recoverable gas originally in place in the dedicated reserves.

The gas will be supplied by Continental Oil Co., Tidewater Oil Co., Atlantic Refining Co., and Cities Service Production Co., jointly known as CATCO. The four hold leases on 95,000 acres of submerged land off the coast of Louisiana. Estimated reserves stand at nearly 1.7 trillion cu ft.

The commission's final okay was held back until the FPC makes an additional study of the price structure. Originally, it was proposed that TGT would pay 22.4 cents/Mcf until Nov. 1, 1958. Then it would go up by 2 cents/Mcf every four years over the life of the contracts. Four intervenors, including the New York Public Service Commission and three of Tennessee's customers, object to the proposed rate. They contend that if it is allowed to stand it would establish a higher-price plateau in an new area to the detriment of consumers.

The importance of the rate issue "cannot easily be overemphasized," said the commission. "This crucial sale should not be permanently certificated unless the rate level has been shown to be in the public interest." It also said that this is the highest price ever proposed for sales to Tennessee Gas.

The commission pointed out, however, that the contracts call for service to begin on Nov. 1, 1957, and that TGT must build its underwater pipelines before the onset of bad weather. Considering this, and the need for the gas on Tennessee's system, the FPC said that it was granting the temporary authorization, but was remanding the proceedings to the presiding examiner "to determine at what rates the public convenience and necessity requires these sales to be made if permanent certificates are to be granted . . . By the procedures adopted here, however, we do not necessarily imply that the rate at which the proposed sales would be made are not in the public interest."

Tennessee will build a 107-mile, $163 million line to link its system with the offshore gas field.

Meanwhile, Louisiana has approved the first permit for construction of an undersea natural gas pipeline. The contract signed by Governor Long authorizes TGT to lay a line from the coast of Cameron parish 32 miles southward into the Gulf. Tennessee is to pay the state $15,000 for the permit for the right to dig underwater trenches across some 20 lease blocks in the Gulf. The permit is conditioned to block interference with navigation, hunting, fishing and related activities. Construction must start within two years of issuance of the permit and TGT can't let construction rights to any one else without consent of the State of Louisiana.

NGPL supplements existing plans by 185 MMcf/day

Natural Gas Pipeline Co. of America has asked the FPC for permission to increase its daily deliverability in addition to its current major expansion program pending before the commission.

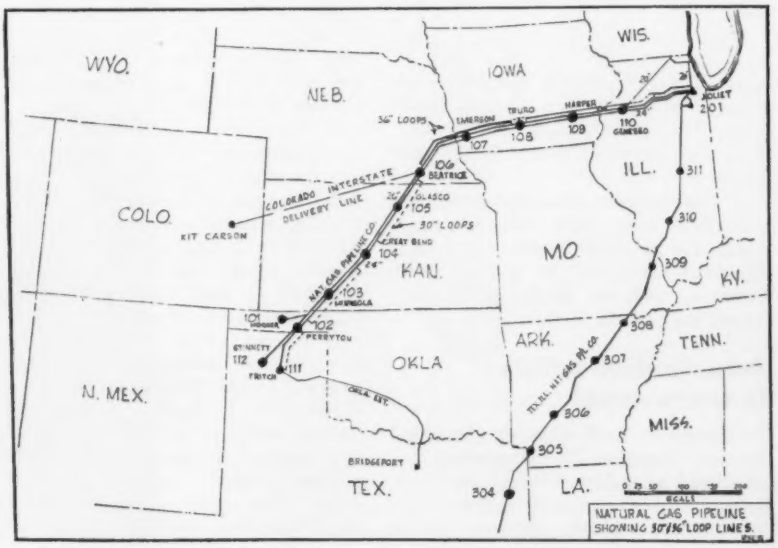
The additions will amount to 185 MMcf/day over and above the projected 485 MMcf enlargement project. The combined effect of these separate expansion plans will be to increase by 670 MMcf the present deliverability capacity of 510 MMcf.

Construction work for the new expansion plan will include installation of 337 miles of 30-in. loop between the company's terminus in Fritch, Texas and Beatrice, Neb. Fifty-nine miles of 36-in. line will also be laid between Beatrice and Joliet, Ill.

At present NGPL's line is made up of dual 24- and 26-in. lines. The two expansion plans now before the FPC will result in paralleling all these lines with new large diameter pipeline. There will be 29,750 increased compressor engine horsepower in stations along the mainline from Fritch to Joliet.

A good portion of the 185 MMcf will come from the company's new extension from Jack and Wise counties, Texas, to its mainline at Fritch. FPC approval of this project was given last December.

Other sources in the Texas Panhandle and in Oklahoma will pro-



Natural Gas Pipeline's 30- and 36-in. looping job will add another 185 MMcf/day to its system capacity.

vide the balance. The largest of these suppliers is Lone Star Gas Co., scheduled to make delivery of up to 100 MMcf/day to NGPL at a point on the extension line in Oklahoma.

Delivery date for this additional gas supply is the 1959-60 winter season. The 1958-59 season is the target set for the 485 MMcf expansion.

Depletion allowance cut target of Senate committee

A special Senate Finance Committee study of tax and credit policies may provide the opening forum for the drive building up to cut the depletion allowances for gas and oil.

The committee, using a special staff, will look into alleged cases of "favoritism" in existing government policies on taxes and credit. One target will be credit granted by this country to firms paying foreign taxes. Another "will probably" be the depletion allowances, a committee spokesman says.

Attacks on the oil and gas depletion allowances have stepped up in the current congressional economy drive. Among the witnesses at the Finance Committee hearings will probably be Treasury Secretary George Humphrey, who has in the past supported the 27.5 per cent rate for gas and oil operations —the highest rate granted under the depletion allowance schedules.

Chairman of the Finance Committee—a powerful congressional instrument—is Sen. Harry F. Byrd, ultra-conservative Virginia Democrat.

The committee's study, which will undoubtedly run for many months, won't produce material for a cut in the depletion schedules this year. But it may lend fuel to the fires opponents will try to set in 1958.

If the current economy drive is combined next year with a campaign for personal income tax cuts, the lawmakers will be looking for revenue, and the depletion allowances may be in danger.

Amortization policies in for reversal

Change in leadership at the Office of Defense Mobilization has produced a quick reversal in the government's tax amortization policies on gas and oil pipelines.

As one of his last acts before leaving his long-time job as head of ODM, Arthur S. Flemming broadened the expansion program for oil and gas pipelines to include "strategically located" pipelines and storage facilities. Previously, only those facilities erected solely for military or atomic energy uses were eligible.

This would have permitted the government to give firms constructing new transportation or storage facilities to write off a part of their cost for tax purposes in five years, instead of the normal 20 or more.

Less than two months later, however, Gordon Gray, the new top man at ODM, announced that there would be no more fast tax amortization for any gas or oil pipelines under existing conditions. He indicated that the agency now believes there is no defense need for further pipeline or storage facilities.

One firm was granted fast tax amortization for strategically located oil and gas storage and exploration facilities in the short time the broadened goal was open.

"Too hot to handle" sand controlled by new pipe

Science and determination teamed up to make production possible from a gas and distillate sand considered too hot to handle less than three years ago. Tidewater Oil Co.'s No. 1 Thibodeaux has been completed in Acadia Parish, La., with shut-in pressures exceeding 10,000 lb and a bottom hole pressure estimated above 12,000 psi.

On initial production test, the Tidewater well made 4 MMcf of gas daily through a 10/64-in. choke from perforations at 14,298-300 and 14,314-16 ft, plus an ungauged amount of distillate.

In 1953 Tidewater drilled a test in the area and hit a 14,500-ft gas and distillate sand with a bottom hole pressure estimated at 13,000 lb. The operators decided to plug the well back and complete uphole because it was felt that equipment available at that time made such high pressure production risky.

In the meantime, Tidewater engineers have worked with metallurgists at the National Tube division of U. S. Steel in developing pipe of sufficient strength to make this production possible. The resulting product was designated P-110. This pipe was first used in the Richardson and Bass test, in which John W. Mecom and Freeport Sulphur Co. participated, which turned out to be the world's deepest hole and the world's deepest well.

In Tidewater's well, this special pipe was used for a 7-in. oil string as well as 4½- and 2-in. tubing.

Houston's Cameron Iron Works developed a special 15,000-lb capacity Christmas tree for the Tidewater well to control the gauged 10,071-lb shut-in pressure and 10,087-lb casing pressure. Flowing pressures are 9007 lb on the tubing and 9145 on the casing.

Natural Gas Pipeline wrapping new line

Natural Gas Pipeline Co. of America is coating its 88-mile, 20-in. line between Bridegport, Texas and Lindsay, Oklahoma, with Polyken #900 protective tape coatings.

This is the second large-diameter line on which the Polyken method has been used in recent months. The other is the 122-mile, 22-in. American Louisiana line between Defiance, Ohio, and Bridgman, Mich.

Communication equipment shown at Houston meeting

Demonstration of the latest mobile radio units and microwave equipment for use in the petroleum industry was featured at the recent Petroleum Industry Electrical Association and Petroleum Electric Supply Association annual convention held in Houston.

One of the highlights of the display was General Electric's two-way radio demonstration which introduced the company's new Channel Guard tone squelch system. This system has been designed to reduce interference problems for petroleum radio users.

GE's convention booth was tied in with Transcontinental Gas Pipeline Corp.'s microwave system extending from Houston to Linden, N. Y. Via Transco's system, installed by GE in 1952, voice transmissions from Texas to New Jersey and return were heard.

The new Channel Guard unit has been designed to relieve two-way radio users of the necessity of listening to transmissions of other operators sharing the same channel. It embodies a double-barrelled approach combining advantages of both tone squelch and conventional noise squelch.

The system superimposes con-

How you benefit from

New Fast Winding

ROCKWELL CHART DRIVES

SAVE TIME Whether you wind by key or crank, you will find that *new* fast winding Rockwell Chart Drives will reduce the time and effort required to service your recording instruments. Fewer turns, easier turns result from an entirely new gearing design.

REDUCE MAINTENANCE A stronger, double bushed winding pinion now minimizes one of the principal causes for chart drive failure. Powdered metal bushings throughout the new winding mechanism eliminate all need for lubrication.

FACTORY MODERNIZATION AND REBUILDING SERVICE All old model Rockwell Chart Drives returned to the factory will be modernized with the latest advancements including the new fast wind mechanism *at no additional cost* beyond the regular nominal service charge. Now is the time to upgrade your instrumentation. Ship us your old Rockwell Chart Drives for thorough rebuilding and modernization.

ROCKWELL MANUFACTURING COMPANY

INSTRUMENT DIVISION BOX 2396, TULSA, OKLA.

Atlanta Boston Charlotte Chicago Dallas Denver Houston Los Angeles Midland, Texas New Orleans New York N. Kansas City Philadelphia Pittsburgh San Francisco Seattle Shreveport Tulsa

In Canada: Rockwell Manufacturing Co. of Canada, Ltd., Toronto, Ont.

Tunis Corbell and Ralph Lowe, GE microwave systems engineers, check Quadriphase multiplexing equipment. Among its features are a transmitter which swings forward from the front of the panel to provide ease of maintenance; a termination unit (at right of rack) which also swings out for front servicing; and an attenuator which measures performance of the system with no interruption of communications.

tinuous tone on normal squelch to assure a greater degree of privacy in communications than has been previously possible in the mobile radio field, according to Robert L. Casselberry, manager of product planning for GE's communication products department.

Channel Guard will have wide applicability in the petroleum industry. The automatic monitoring feature will enable users to maintain their present high standards of channel courtesy while obtaining relief from interference caused by co-channel users.

Gulf Interstate's expansion okayed

Gulf Interstate Gas Co., Houston, has temporary authority from the FPC (Docket G-11880) to build $24.5 million in new facilities. Gulf Interstate's daily delivery capacity will be increased to 575 MMcf/day.

Included in the plan: addition of 69,000 hp at 10 existing mainline compressor stations in Kentucky, Tennessee, Mississippi, and Louisiana; a 300-hp station at East Mud Lake field in Cameron parish, La.; and 10 miles of gathering line from Erath field.

Rail and highway crossing code to be studied

A standard specification for pipelines under crossings of railroads and highways will be recommended by a committee of the American Society of Civil Engineers.

The committee is composed of members representing gas, oil, products pipeline, railroads, the FPC, ASA, Bureau of Public Roads, state highway departments, toll road authorities, the American Concrete Pressure Pipe Association, Iowa Commerce Commission, the American Gas Association, American Petroleum Institute, Southern Gas Association, and other interested groups.

The need for a standard for pipeline crossings for highways and railroads is becoming more urgent. Longer and larger diameter pipelines are crossing literally hundreds of different state and local highways and railroads. One division of a railroad may have, and sometimes does have, different specifications for the same class of road as another division. And many highways are adopting codes which vary for the same class of construction.

With the many different specifications now in use, it has been increasingly difficult for pipeline companies to obtain the proper materials and design for each individual condition. Pipeline materials often must be ordered two years in advance of construction and many times before crossing permit data are available. It is believed that a properly developed standard could speed the issuance of permits of railroads and highways, thus cutting down the volumes of correspondence which are oftentimes necessary for a single pipeline crossing. It will assure the railroad or highway department of a safe, well engineered crossing.

The American Society of Civil Engineers committee is not a code writing organization, but will assemble the information from viewpoints and the engineering information contributed by all of the interested organizations. Also, the ASCE itself is a representative of all the interests involved and is not attempting to suggest a code which will tend to favor any particular group. The committee is aware, of course, the pipeline companies will have to conform to existing pipeline codes and to the loading design of the highway or railroad.

When the tentative specifications prepared by the ASCE committee are acceptable to its committee membership, it will be submitted to the ASA and if approved by that body, will be adopted as a standard code for pipeline under crossings of railroads and highways.

The present membership of the committee consists of approximately 25 engineers from the groups named. J. E. Thompson, superintendent of pipeline construction for Natural Gas Pipeline Co. of America, is chairman.

Texas house rejects gas tax bill

The Texas house of representatives rejected on a technical question the first test of a multi-million dollar natural gas bill endorsed by Gov. Price Daniel (see GAS, May, p. 178).

Rep. Tom Joseph, sponsor of the bill, sought to add the 11-word enacting clause without which no bill can become law. The vote came on his motion to correct the omission. Action required two-third majority and it fell far short.

The tax would be levied at the rate of three fourths of one cent per Mcf on dedicated gas reserves.

FPC has $187 million rate cases pending

Suspension proceedings involving rate increases totaling about $187.5 million a year are pending before the FPC.

FPC Chairman Jerome Kuykendall said also that 33 investigations are under way into rates charged by independent producers, and another nine cases involving various rate matters of both interstate pipelines and independent producers are under investigation.

On file are 38 formal proposals by interstate pipelines in which the commission has suspended increases totaling about $159.7 million yearly.

The pending independent producers rate suspension cases total 35, involving 418 proposed increases totaling $27.8 million yearly.

Cities Service generating service sales approved

Overruling objections from the National Coal Association, United Mine Workers of America, and Fuels Research Council, the FPC has given final authorization to

He skipped the same 2 valves again today

Both are still in adjustment. Still no leaks, not even at the shank! Both are OIC plug valves. If he's curious enough to dismantle one, he'll see the OIC gland and O-ring construction that saves him time and cussing. It's different from other plug valves he's seen.

Three efficient seals prevent shank leakage on OIC plug valves. Concentric grooves machined into the gland liner form a "labyrinth" seal. The liner also retains an O-ring in contact with the plug's top face for a second positive seal. And resilient packing between gland and gland liner forms the third seal.

But the maintenance man measures design by *results*. OIC plug valves get his O. K. because they stay in adjustment a long time without leakage. However, if *you* are interested in the exclusive gland design and construction of these OIC plug valves, write for specification literature.

The Ohio Injector Company • Wadsworth, Ohio

OIC VALVES

FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON VALVES

Cities Service Gas Co.'s plan to supply gas to a Missouri Public Service Co. electric generating station.

Service will be on an interruptible basis to the Ralph Green station at Pleasant Hill, Mo. The Gas Service Co. will supply the first 1 MMcf/day with any excess to come from Cities Service.

The exceptions questioned whether evidence of gas supply in the record was sufficient to show that service could be rendered without adversely affecting service to jurisdictional customers. They also questioned whether it was in the public interest to certificate gas service when coal is available in ample supply at reasonable cost.

The commission found "that both the ultimate conclusions and the subsidiary findings . . . are supported by the evidence. That evidence shows that the service . . . will result in substantial benefits to Cities Service and to its customers."

Cooperatives withdraw FPC applications

Seven Idaho cooperatives have withdrawn FPC applications seeking to build natural gas facilities and get a supply of gas from Pacific Northwest Pipeline Corp. (Dockets G-10579, et al).

The withdrawn applications were originally filed in August, 1956, by cooperatives in Caldwell, Jerome, Meridian, Montpelier, Mountain Home, Rupert and Weiser. Applications filed by five other Idaho cooperatives are still pending FPC action.

Texas Gas Corp. honored by Beaumont

Texas Gas Corp. recently was cited as the "industry of the year" by the Beaumont (Texas) Lions club.

Special commendation was given the company for its publication, *Plant Site*, a quarterly circulated among more than 7500 industries throughout the nation. It is designed to encourage industry to locate in the east Texas Gulf Coast area.

In accepting the citation Texas Gas Corp.'s president Russell M. Riggins said his company will expand its refining and gas processing plant at Winnie, Texas, to develop and produce raw materials or feed stocks for the area's chemical plants.

Mr. Riggins said that Texas Gas has under consideration the possibility of new plants for the production of ethanol and the extraction of pure cyclo-hexane. He also announced that the refining division of the Winnie plant has begun producing 100 octane gasoline.

PIEA and PESA hold joint conference in Houston

New officers have been elected by the Petroleum Industry Electrical Association and the Petroleum Electric Supply Association. The groups held their 29th annual joint conference recently in Houston.

John O. Holder succeeds H. A. Rhodes as president of PIEA. Mr. Rhodes becomes chairman of the board. Other PIEA officers include E. H. Wilder, vice president, and E. B. Dunn, secretary-treasurer. In addition to Rhodes, directors are Tom B. Kelly, D. R. Wofford, and A. E. De Mattei.

John E. Metzenthin is the new president of PESA. He succeeds R. J. Smith, who becomes board chairman. Other PESA officers are Douglas Ball, vice president, and Pat King, executive secretary-treasurer. Directors are Thiel W. Sharpe, H. C. Shelton, Ralph Asbury, C. A. Gunn, and Pat Wilson.

PNW plans $17 million savings by revisions

Pacific Northwest Pipeline Corp., Salt Lake City, has supplemented two pending applications which will reduce estimated cost of facilities by $17 million (Dockets G-10426 and 10455).

In Docket G-10426, PNW wants to eliminate a 4500-hp addition to its compressor station No. 6. Instead, the facilities would include 3320 additional hp in two existing stations and a sales meter station. This would cut estimated cost from $3.1 million to $1.1 million.

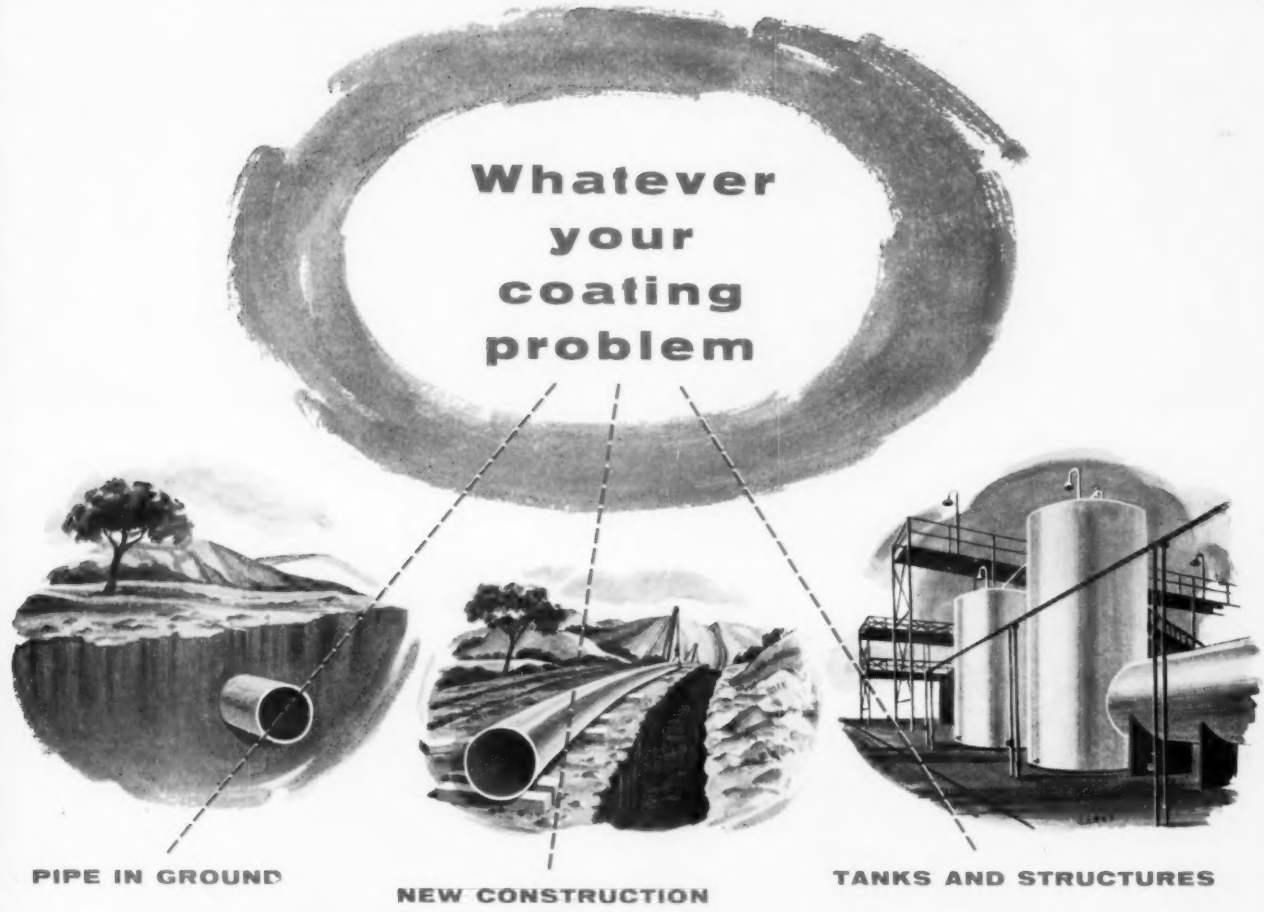
In Docket G-10455, the company now seeks authorization for 22,500 hp in existing stations in lieu of the initially proposed 55,500 hp in existing and new compressor stations. The company also proposes to install sales meter facilities in an existing compressor station and to enlarge its San Juan processing plant. The estimated cost of these facilities is $9.1 million compared with an estimated $24.2 million as originally proposed.

Manufacturers Light gets construction go-ahead

Two projects of Manufacturers Light & Heat Co., Pittsburgh, have FPC okay for construction.

Under Docket G-12155, Manufacturers will build facilities to provide direct natural gas service to Olin Mathieson Chemical Corp.'s aluminum plant near Buck Hill Bottom, Monroe county, Ohio. In its original application, Manufacturers said Olin Mathieson estimates its annual requirements for 1958 at 2.5 billion cu ft and said

Russell M. Riggins (center) accepts congratulations for Texas Gas Corp. from Paul Youngdale, president of the Beaumont Lions club (left) and Howard Hicks, Beaumont Chamber of Commerce.



look to Copon® for a solution

Proven systems for external or internal protection of...

- Dehydrated gas lines
- Crude and petroleum product lines
- Salt water lines
- Fresh water lines
- Oil well tubing and casing
- Repressuring units

In every phase of the oil and gas industry, Copon Coatings are doing a job reducing corrosion losses. But in many instances, they are accomplishing even more.

Gas transmission companies report smooth, durable Copon Internal Pipe Coatings provide extra dividends of increased thru-put, cleaner delivery and reduced pigging costs. Installations at pumping plants and refineries prove Copon External Tank Coatings stay dazzling white despite exposure to severe atmospheric conditions, chemical fumes and spillage.

Copon Coatings, and systems for coating underground pipe lines in place or individual joints for new construction, have been developed in close cooperation with leading corrosion engineers. A complete technical service is available. Write today for help with your specific problem.

Copon®

FOR CORROSION CONTROL

For complete information on Copon, write on your company letterhead to the manufacturer located nearest your city.

ALLIED PAINT MFG. COMPANY
P. O. Box 1088, Tulsa, Okla.

BENNETT'S
65 W. First South St.,
Salt Lake City 10, Utah

WALTER N. BOYSEN CO.
42nd & Linden Sts., Oakland 8, Calif.
2309 E. 15th St., Los Angeles, Calif.

BRITISH AMERICA PAINT CO., LTD.
P. O. Box 70, Victoria, B. C., Canada

BROOKLYN PAINT & VARNISH CO., INC.
50 Jay Street, Brooklyn 1, N. Y.

COAST PAINT & LACQUER CO.
P. O. Box 1113, Houston 1, Texas

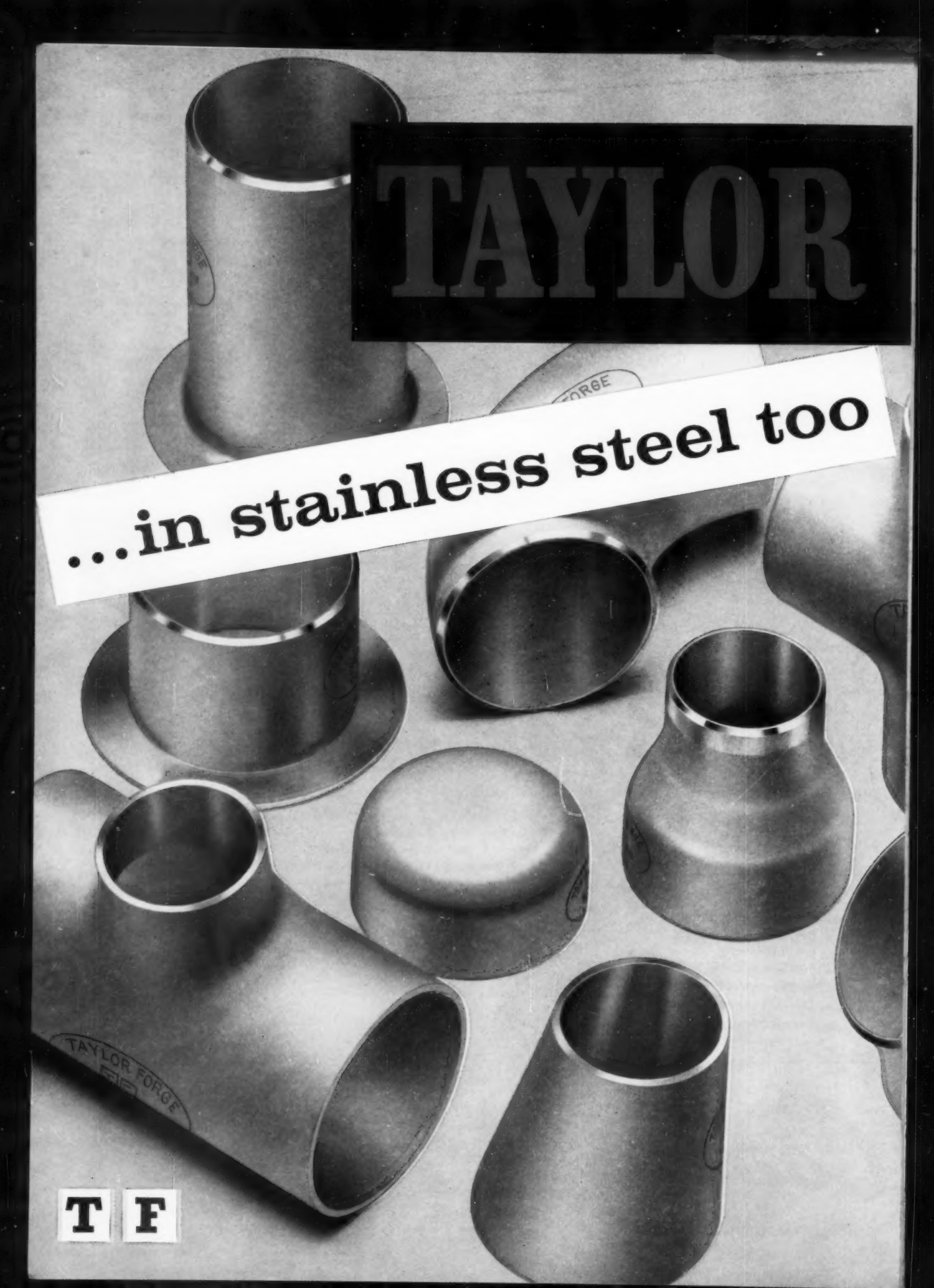
ENTERPRISE PAINT MANUFACTURING CO
2841 S. Ashland Ave., Chicago 8, Ill.

HANNA PAINT CO., INC.
P. O. Box 3206, S. H. Station,
Birmingham 5, Ala.

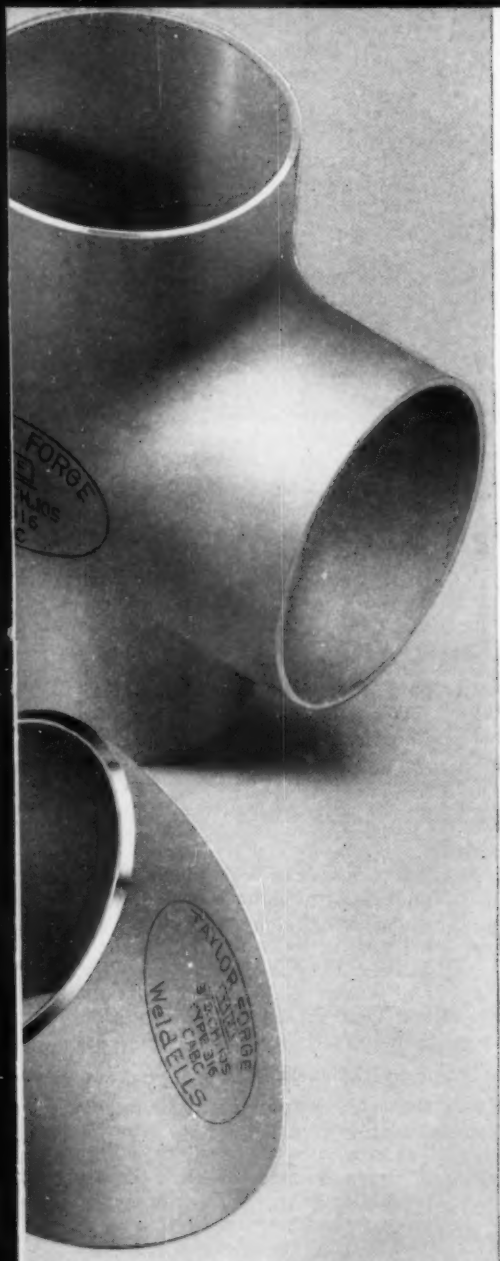
KOHLER-McLISTER PAINT CO.
P. O. Box 546, Denver 1, Colo.

McDOUGALL-BUTLER CO., INC.
2929 Main St., Buffalo 14, New York

JAMES B. SIPE and COMPANY, INC.
P. O. Box 8010, Pittsburgh 16, Pa.


TAYLOR
...in stainless steel too
TAYLOR FORGE
T F

FORGE Welding Fittings and Forged Flanges



The complete line . . . the quality line . . . whatever you need . . . here it is . . .

* Schedules 5S—10S—40S—80S as well as all sizes and thicknesses covered by Standards in carbon steel.

* Seamless* WeldELLS—Tees—Reducers—Lap Joint Stub Ends—Caps—Crosses—Flanges—regularly furnished in stainless steel types 304—304L—347—316—316L. Details regarding other types of stainless and corrosion resistant alloys gladly supplied upon request.

*NOTE: Schedules 5S and 10S 90° and 45° WeldELLS are furnished seamless in sizes through 6". Schedules 40S and 80S are furnished seamless in all sizes.

...TRADITIONALLY DEPENDABLE

Taylor Forge & Pipe Works

General Offices and Works: P. O. Box 485, Chicago 90, Illinois
Plants at: Carnegie, Pa., Gary, Ind., Houston, Texas, Fontana, Calif., Hamilton, Ont., Canada
District Sales Offices: New York, Boston, Philadelphia, Pittsburgh, Atlanta, Chicago, Houston, Tulsa, Los Angeles, San Francisco, Seattle, Toronto, Calgary.

To take full advantage of both product excellence and fine service, patronize your local Taylor Forge Distributor.

the chemical company would need the gas by May 1, 1957. The requirement will increase to a maximum of 9 MMcf/day by July 1, 1957.

The FPC has okayed Manufacturers proposal to construct and operate a 5280-hp compressor station and other related facilities in Marshall county, W. Va. (Docket G-11167).

FPC wants '56 report from independents

Under a proposed FPC rule, independent producers will be required to file reports for 1956 on their natural gas sales and revenues.

The commission said that the form adopted last year required a minimum of information from independent producers in lieu of the comprehensive accounting and reporting requirements of the Natural Gas Act. While the exemption from the accounting and reporting requirements is being continued, the commission has found "that more complete information with regard to natural gas sales . . . is essential to proper administration of the . . . Act."

The proposed 1956 reporting form provides for the inclusion of financial data and information concerning rate schedules filed by producers on behalf of others. Producers whose interstate sales were 250 MMcf or less for the year would be required to report only limited information.

Fifty-mile Oklahoma line okayed for CIG

Fifty miles of 22-in. line will be built in Oklahoma by Colorado Interstate Gas Co. so the company can receive a newly acquired gas supply from the Mocane field in Oklahoma (Docket G-10176).

The $2.4 million line will extend from CIG's new supply to a connection with its existing system at Hooker, Okla. This 50-mile line is part of Colorado Interstate's larger project involving increased deliveries to Natural Gas Pipeline Co. of America.

The FPC said the temporary authorization is without prejudice to such ultimate disposition of CIG's application as the record may require. It also said that the temporary certificate was being issued upon representations made by a company official to the effect that if the application is ultimately denied, in whole or in part (including the 50-mile line), the installation cost will be removed from Colorado Interstate's rate base with the costs to be chargeable solely to the company's stockholders.

GAS pipeline notes

The FPC has okayed New York State Natural Gas Corp. plans to construct and operate 14.6 miles of line and to operate 17 miles of already built line in Pennsylvania and New York. The company will replace 56.5 miles of 20-in. line from Tioga county, Pa., to Ithaca, N. Y., with 30-in. line over a period of four years (Docket G-9138).

Eight-six mainline compressor engines will be supercharged by Natural Gas Pipeline Co. of America (Docket 9966). The stations are in Oklahoma, Kansas, Nebraska, Iowa and Illinois. The FPC granted the company permission to operate the engines temporarily provided NGPL doesn't use the compressors to deliver gas beyond its presently authorized design system sales capacity—510 MMcf/day—until further order of the commission.

The FPC has suspended tariff changes proposed by American Louisiana Pipe Line Co. which would provide for a demand-commodity form of rate instead of the cost-of-service type prescribed by the commission (see GAS, May, p. 179). The commission said that the proposed rate changes are based upon adjustments in the cost and volume of gas purchased and other operating expenses, taxes, and depreciation expense. It said that these items have not been shown to be justified, "and the tendered changes in rates may be unjust, unreasonable, unduly discriminatory or preferential, or otherwise unlawful."

Mississippi River Fuel Corp., St. Louis, intends to increase its system capacity by 10 MMcf/day to meet commitments to existing customers (Docket G-12343). The new $6.9 million facilities include installing 6400 hp in compressor units at four previously authorized and existing stations. A total of 54 miles of 26-in. loops will be built.

Southern Natural Gas Co., Birmingham, asked the FPC for permission to attach and transport gas from new sources of supply (Docket G-12342). The $23.5 million undertaking would extend over a 12-month period. Included are lateral supply lines, meter stations from new fields, and loops and compressor facilities along existing supply lines. Purpose: To connect system reserves of approximately 1 trillion cu ft, principally in the southern Louisiana area.

The Steel & Engineering Products Co., El Paso, has been named sales representative for New Mexico and the western tip of Texas by J. F. Pritchard & Co., Kansas City, Mo.

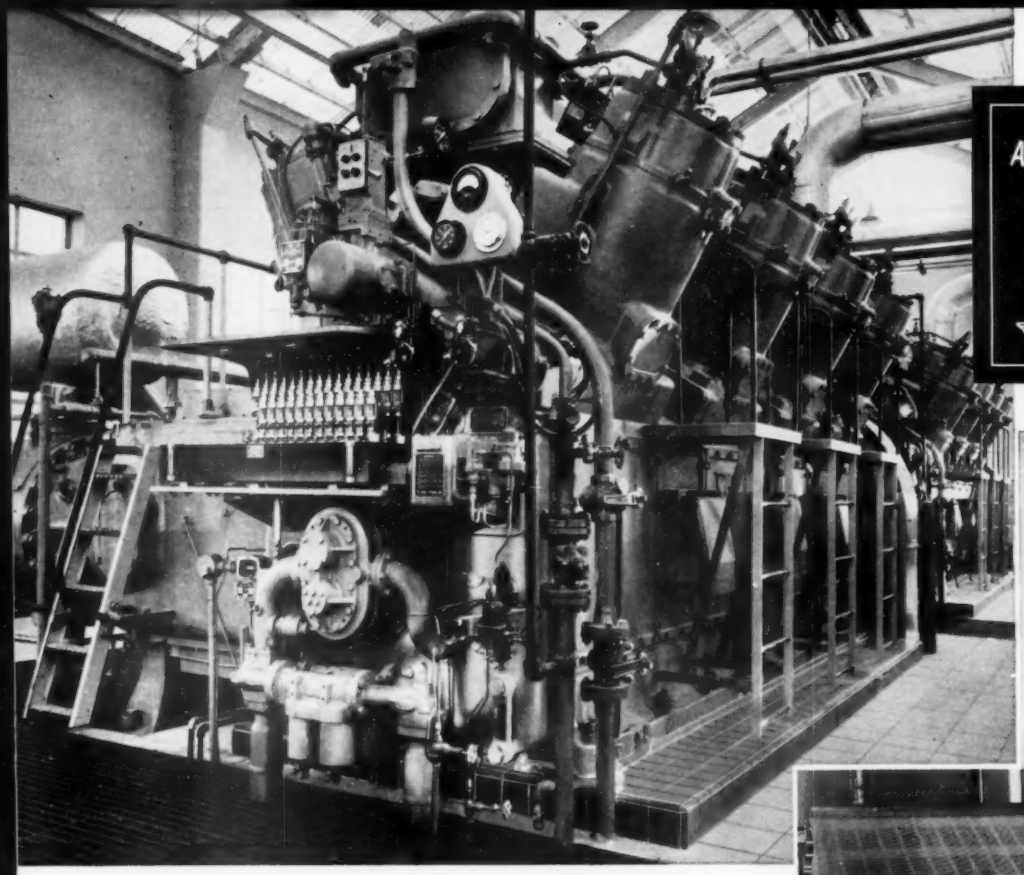
The FPC has rejected a revised billing statement submitted by Phillips Petroleum Co. by which Phillips attempted to increase its rates for gas sold to Panhandle Eastern Pipe Line Co. The FPC said that in order to increase its rates under the rate schedule covering this sale, Phillips must file a change in rates as required by the Natural Gas Act and FPC regulations. The commission declared that the filing of a revised billing statement "does not suffice."

Good-All Electric Manufacturing Co., Ogallala, Neb., has won the President's Citation of appreciation for hiring handicapped persons. Q. T. Wiles, Good-All president, received the citation for his company.

Rockwell Manufacturing Co., Pittsburgh, has acquired the assets of Republic Flow Meters Co., Chicago. Present management of Republic will remain unchanged, with James D. Cunningham, founder of the company, continuing as president.

The boards of both Carrier Corp. and Elliott Co. have agreed upon the basis whereby Elliott will be merged into Carrier. When the merger becomes effective, Elliott will continue under its present management as a division of Carrier.

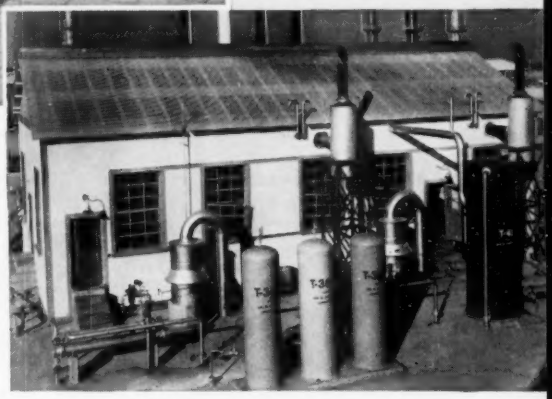
Rochester (N.Y.) Gas & Electric Corp. is extending its 16-in. gas feeder line. According to Linn B. Bowman, vice president in charge of gas and transportation, the extension will improve facilities for gas service along the line. It will also help maintain service of a high quality in Irondequoit and the Sea Breeze areas.



Another example of efficient compression at lower cost

Petroleos Mexicanos' Reynosa station, showing 8-cylinder Cooper-Bessemer V-angle compressors.

Exterior view of the neat, compact Reynosa gasoline plant.



COOPER-BESSEMER COMPRESSORS FOR PETROLEOS MEXICANOS

. . . extreme dependability
. . . extremely economical

● The compression of natural gas and propane in Petroleos Mexicanos' gasoline plant, Reynosa, Tamps., Mexico, is a perfect example of extremes . . . all good!

Handling three pressure ranges, and handling them reliably and at low cost, is a brief summation of the Cooper-Bessemer performance story in this modern station.

Two 8-cylinder Cooper-Bessemer compressors handle plant process gas as well as compressing gas for distribution in northeast areas of Mexico and for export.

Known not only for performance . . . the name Cooper-Bessemer means cooperation and service all along the line. Detailed installation recommendations, experienced service engineers, availability and rapid delivery of spare parts from centrally located warehouses . . . each helps make your job easier, helps keep costs at a minimum. Find out for yourself, next time plans call for compressors up to 6,000 hp, check with Cooper-Bessemer.

ENGINES: GAS • DIESEL • GAS-DIESEL COMPRESSORS: RECIPROCATING AND CENTRIFUGAL, ENGINE OR MOTOR DRIVEN

cooper-bessemer

MOUNT VERNON, OHIO • GROVE CITY, PENNA.

Branches in principal U.S. Cities, also: Edmonton and Calgary, Alberta • Halifax, N.S. • Caracas, Venezuela • Mexico City, Mex.

GAS pipeline people

E. Clyde McGraw
Transco

Tom P. Walker
Transco

John B. Tweedy
Southern Natural

J. J. Hedrick
NGPL

Eskil Bjork
NGPL

Mark Burlingame
NGPL

Directors of Transcontinental Gas Pipe Line Corp., Houston, have named TOM P. WALKER to the newly created position of chairman of the board and elected E. CLYDE MCGRAW to succeed him as president and chief executive officer of the company. Mr. Walker has been president of Transco for the past four years. Previously he had been a vice president of Irving Trust Co. of New York in charge of its utility department. Mr. McGraw has been executive vice president of Transco since 1955. He has been associated with the company since its inception, serving initially as operating vice president.

JOHN B. TWEEDY has been elected assistant to the chairman of the board of directors of Southern Natural Gas Co. Mr. Tweedy is currently a partner in the Denver law firm of Tweedy & Fowler. From 1950 through 1956 he was a director of Southern Production Co., Inc., and is at present a director of The Offshore Co., a Southern Natural subsidiary. He will headquarter in New York.

D. T. LUTZ has been named superintendent of compressor stations at Malvern, Ark., for Texas Illinois Natural Gas Pipeline Co. He succeeds H. E. JACOBSEN, who has joined Western Pipe Line, Inc. Mr. Lutz was formerly superintendent of the Natural Gas Pipeline Co., compressor station at Stinnett, Texas.

KENNETH W. PAUL, formerly geologist with Shell Oil Co., has joined the Houston office of H. Zinder & Associates, Inc., as geological engineer.

Pipe Linings, Inc., Los Angeles, has named V. L. GREEDY to the post of sales manager.

GLEN F. GRAVES has been promoted to superintendent of the right-of-way department of Trunkline Gas Co., Houston. He has been with the company since its organization in 1950.

R. L. TOPPER, long time assistant chief engineer, has been named executive assistant to the executive vice president of Transcontinental Gas Pipe Line Corp., Houston. HOWARD L. CLINE will succeed Mr. Topper. JOHN C. BOEHM succeeds Mr. Cline as superintendent of compressor stations. And, F. M. WRIGHT succeeds Mr. Boehm as assistant superintendent. Mr. Wright has been superintendent of Transco's compression division headquartered at Charlottesville, Va.

WILLIAM H. WILDES, president of Republic Natural Gas Co., Dallas, since its incorporation in 1934, has been named to the new position of chairman of the board. He will continue as chief executive officer of the company. C. D. WILLIAMS, who recently joined the company as a vice president, has been named president.

Pacific Northwest Pipeline Corp., Salt Lake City, has named DAVID L. ANDERSON to the newly created post of supervisor of gas purchases. Mr. Anderson, who joined the company in 1952, has been serving as district manager of the company's land department. Pacific Northwest has appointed JACK B. OWENS controller. He fills the vacancy created by the resignation of G. BYRON SMITH.

M. M. BOWEN has been elected to the board of directors of General Paint Corp., San Francisco. Mr. Bowen is vice president and general manager of the Hill-Hubbell division of General Paint.

J. N. BAYLEY has been promoted to branch manager for the Atlanta (Ga.) branch of J. I. Case Co., replacing T. E. MOSS, who has resigned. Mr. Bayley has been assistant manager in charge of sales for the branch, which supervises the southeastern area, including Georgia, Alabama, Florida, and part of North Carolina and Tennessee.

JACK W. DAVIS has been appointed regional sales manager for the Johns-Manville pipe division, Rocky Mountain region. The newly established region will encompass the states of Colorado, Idaho, Montana, New Mexico and Wyoming.

The board of directors of Natural Gas Pipeline Co. of America and Texas Illinois Natural Gas Pipeline Co. elected GEORGE P. GARVER president and MARK V. BURLINGAME executive vice president, a new post. Elected chairman and vice chairman, respectively, of the Peoples Gas Light & Coke Co. subsidiaries are ESKIL I. BJORK and JOSEPH J. HEDRICK. These men are also chairman and president, respectively, of Peoples Gas. Other officer elections by the pipeline boards include: DWIGHT B. SPROW,

(*Continued on page* 148)

J&L pipe delivers dependable service

J&L tubular products pass the most critical gas industry test of all . . . service on the job. Long and dependable pipe life is assured through J&L's exacting quality control, extensive research and testing.

Specify J&L drill pipe, casing and tubing for gas well drilling and production, J&L line pipe for gas transmission and distribution. When you buy J&L tubular products you buy long, dependable service on the job. Buttweld, lapweld, seamless and Electricweld are available in size ranges from ½" to 14" O.D.

Write today for complete information on the J&L line of tubular products. Jones & Laughlin Steel Corporation, Department 529, Three Gateway Center, Pittsburgh 30, Pennsylvania.

Jones & Laughlin
STEEL . . . a great name in steel

How to control gas odorization

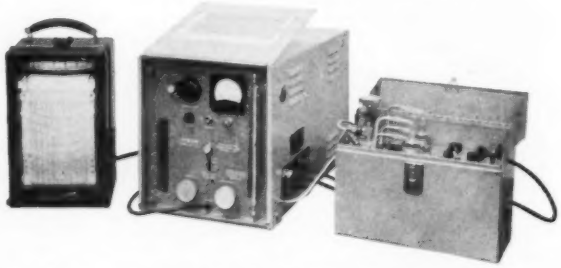
.....and minimize "nuisance" complaints

Before installing CEC's Titrilogs, a large Eastern gas works commonly received several hundred "nuisance" leak reports during short periods—all caused by over-odorization. Since the installation, there has been only one occasion in two years when "nuisance" reports were attributed to the odorant.

This major Eastern company serves 600,000 customers through 150 miles of transmission mains and 2350 miles of distribution mains. Gas odorization is checked by four Consolidated Titrilogs monitoring incoming gas from two transmission companies. Readings from the Titrilog charts are easily converted directly into pounds of odorant per million cubic feet.

When a reading is either above or below prescribed limits, the supplier is notified and immediately corrects his odorization equipment.

CEC's 26-103 PORTABLE TITRILOG



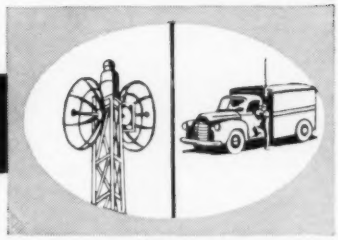
Noted for exceptionally high sensitivity, wide range, and fast response, this stable instrument continuously records sulfur-compounds in concentrations as low as 0.1 ppm or 0.005 grains per 100 cubic feet. *Find out how fast the 26-103 pays for itself. Contact your nearby CEC field office, or write for Bulletin CEC 1810-X16.*

Consolidated Electrodynamics

300 North Sierra Madre Villa, Pasadena, California

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

communications



By FRANK CHAPMAN

Keller foresees establishment of new radio services

SPEAKING before the annual combined meeting of the Petroleum Industry Electrical Association and Petroleum Equipment Suppliers Association in Houston recently, Joseph E. Keller, Washington representative for the PIEA and other oil and gas company interests, detailed the major discussions that are to come before the Federal Communications Commission during the coming months.

Making reference to a basic policy for reducing separation between assignable frequencies in the 152-162 Mc band, he pointed out that the most important part of this forthcoming proceeding will be "the establishment of a number of new radio services and the deletion of others, and, the effects of the eligibility requirements for these newly established services."

"This latter item," he said, "cannot be emphasized enough, for, as a result of the creation of the new services and the new eligibility requirements for these services it may be possible for the Industrial Radio users to operate in more than one of the industrial services.

"In order to illustrate the effect of the proposed channel splitting," he continued, "it is best to first discuss the proposed changes in the nomenclature and eligibility of the various Industrial Services. The Petroleum Radio Service will be retained and it is not anticipated that there will be any changes in the eligibility for operation in this service. The major changes which will take place as a result of this proceeding are in the Special Industrial Radio Service and in the present Power Radio Service. The commission proposes establishing a new Business Radio Service by combining the Low Power and Special Industrial Radio Service and using frequencies from the present Citizens Radio Service. Also, there will be a new Manufacturers Radio Service with 10 exclusive channels obtained from the present Citizens Radio Service. There will be established a new Local Government Radio Service and an Interstate Highway Radio Service. The present Power Radio Service would become the Utilities Radio Service.

"It is interesting to note that the new Business Radio Service has eligibility requirements which contemplate 'Any lawful business activity,' 'educational or philanthropic institutions' and 'clergymen or ecclesiastical institutions.' The words 'any lawful activity' would include petroleum and natural gas, refining and pipeline companies. If such is the case, it would then be possible for Petroleum Radio users to operate not only in the Petroleum Radio Service but also in the new Business Radio Service. Petroleum service companies will be included in this service also.

"Among the proposed changes which will more directly affect the Petroleum Radio Service," Mr. Keller said, "is the establishment of the Manufacturers Radio Service, which will be created out of 10 exclusive channels of 20 frequencies, from the present Citizens Radio Service. The rule making establishing this new service also contemplates the sharing of frequencies with the Petroleum and Forest Products Radio Services. On the other hand, Petroleum Radio users in Texas, Oklahoma, Louisiana, and Arkansas and Forest Products Radio Users in Oregon will be allocated the 30-kilocycle frequencies derived from 'splitting' present power frequencies. Also Petroleum Radio users and Forest Products Radio users will be given limited access to channels derived from splitting in the Taxicab Radio Service the channels to be available only outside metropolitan areas of 50,000 or more in population.

"The present frequencies and new channels derived from 'splitting,'" he pointed out, "will be retained in the Power, Petroleum and Forest Products Radio Services, except for the previously mentioned use of the 30-kilocycle frequencies derived from 'splitting' power frequencies which go to the Petroleum Radio Service in Texas, Oklahoma, Louisiana and Arkansas. The new rule makings propose to apportion regularized 450-460-Mc frequency pairs by giving six to the Petroleum Radio Service and the Forest Products on a shared basis; three to the new Business Radio Service; five to users presently eligible in the present Power Radio Service, and five to communications common carriers in the latter Service. With regard to the communications common carriers, it should be noted that the new rule-makings also propose to provide limited eligibility of communications common carriers in the Power Radio Service with five exclusive frequency pairs in the 450-460-Mc band available."

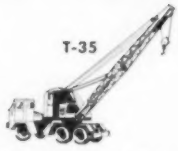
Referring to the commission's

BANTAMS
save you money on any pipeline job

Whether you use a BANTAM as the only machine on the job—or as one machine in a big spread—you'll find it the most versatile and lowest cost producer you can own.

With the back hoe, for example, you can dig 100′ of 5′ trench per hour—and to 15′ depths. With the crane, you have lifting capacities up to 8 tons for all kinds of heavy assignments. But whatever the task—trenching, lifting, loading, handling pipe, backfilling, pile driving, etc.—you're ready for it in jig time with any one of BANTAM's 9 quick-change attachments.

There's a BANTAM to fit your needs: truck mounted, crawler mounted or self-propelled. And whichever you choose, you'll have dependability and rock-bottom costs. BANTAM is the most job-proved rig in the industry. Nearly 8000 BANTAMS have proved it! Get the facts about BANTAMS in pipeline work. Use the coupon.



Carrier mounted. Capacities up to 16,000 lbs.

Crawler mounted. Provides two-speed independent travel.

Self-Propelled. For complete one-man operation.

SCHIELD Bantam Co.

WORLD'S LARGEST PRODUCER OF TRUCK CRANES AND EXCAVATORS

Schield Bantam Company, 252 Park St., Waverly, Iowa, U.S.A. G-155
Please send data on BANTAM checked below:

☐ Carrier Mounted ☐ Crawler Mounted ☐ Self-Propelled

Name_____ Title_____

Company_____

Address_____

City_____ State_____

proposed inquiry to re-examine its basic frequency allocations policies in the radio spectrum between 25 and 890 Mc., Mr. Keller pointed out that "although the inquiry will be a fact-finding hearing of a legislative type to be held at some future date to be set by the commission, it has requested those persons desiring to participate in the proceeding to submit statements and comments by July 1, 1957."

He said that the commission release announcing the inquiry indicated that the issues would:

"1) Review the present allocations of frequencies in this part of the spectrum in the light of the technological progress which has been made since the last review which was in 1944 and to determine whether a more efficient utilization of the spectrum space can be made.

"2) Evaluate the long-range requirements of existing and potential users.

"3) Obtain data as to the feasibility of applying known and potential techniques and methods relating to efficient utilization of spectrum space.

"4) Elevate what system, or systems, of frequency allocations for the future would best serve the public interest.

"5) Obtain knowledge of the possible conflicts between the requirements of non-government radio service and the space allocated to government users.

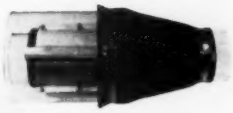
"6) Consider long-range plans for the future use of the radio spectrum and, in particular, to determine the impact, economic and otherwise, upon users of the spectrum and the general public of implementing desirable future changes, and

"7) Assist the commission in formulating its position with regard to the preparation of the United States proposals at the International Radio Conference in 1959."

In making reference to the reallocation of frequencies in the bands above 890 Mc., Mr. Keller pointed out that the main issue in the proceeding is "What are the present uses and future demands for private use of microwave frequencies and could these uses, both present and future, best be served

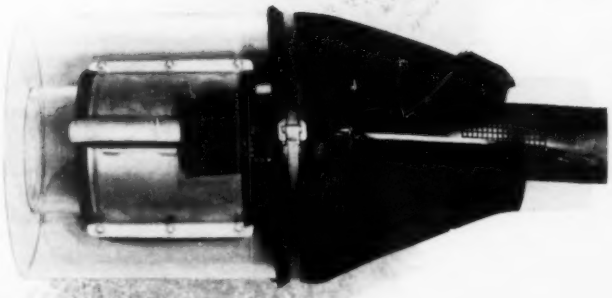
CROSSING INSULATORS & CASING SEALS . . .

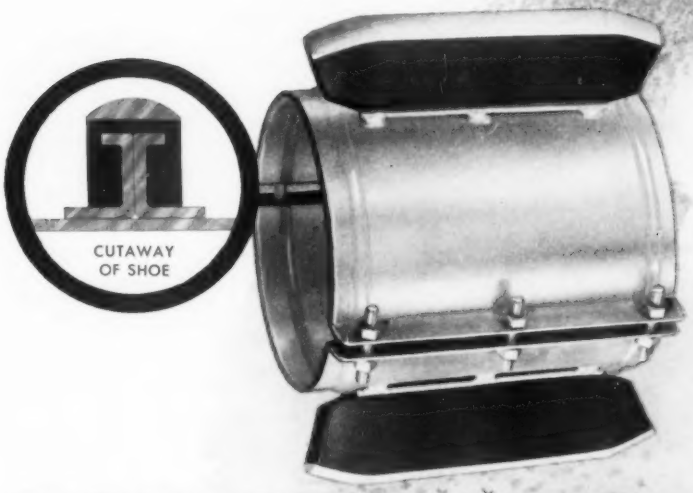
. . . FOR ANY JOB!



Maloney Zipper Type
Casing Seals

All neoprene used in the Maloney Seal (and insulator) is live resilient rubber. It is the best rubber that can be compounded.



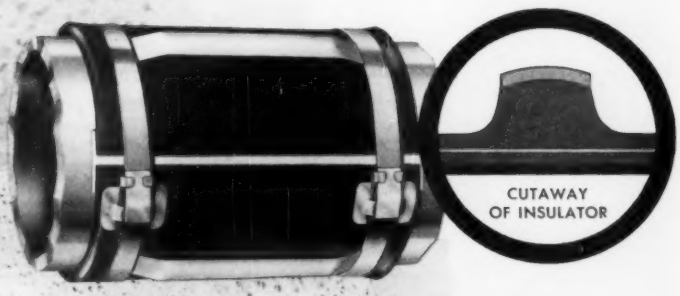


The Maloney Model 55 Crossing Insulator
For all Sizes of Pipe

These insulators have superior insulation qualities because of the low moisture absorption and the long life compounded into the neoprene. The wide steel, sled type runners make installation easy. The extra wide band affords a positive grip. Bonded metal-to-neoprene-to-metal, the runner insulates and also permits flexibility to compensate for pipe shifting. Ribbed neoprene lining can be furnished if desired.

The Maloney Model 56 Casing Insulator
Manufactured in sizes from 2" through 12"

Manufactured with neoprene, which is vulcanized to the steel band core and to the rounded steel runners, there is no place to "short-out" between the casing and the carrier line. The steel core is completely surrounded with neoprene and is bonded under heat and pressure to give the same strength as on army tank tread blocks.



"Something from the Irishman"

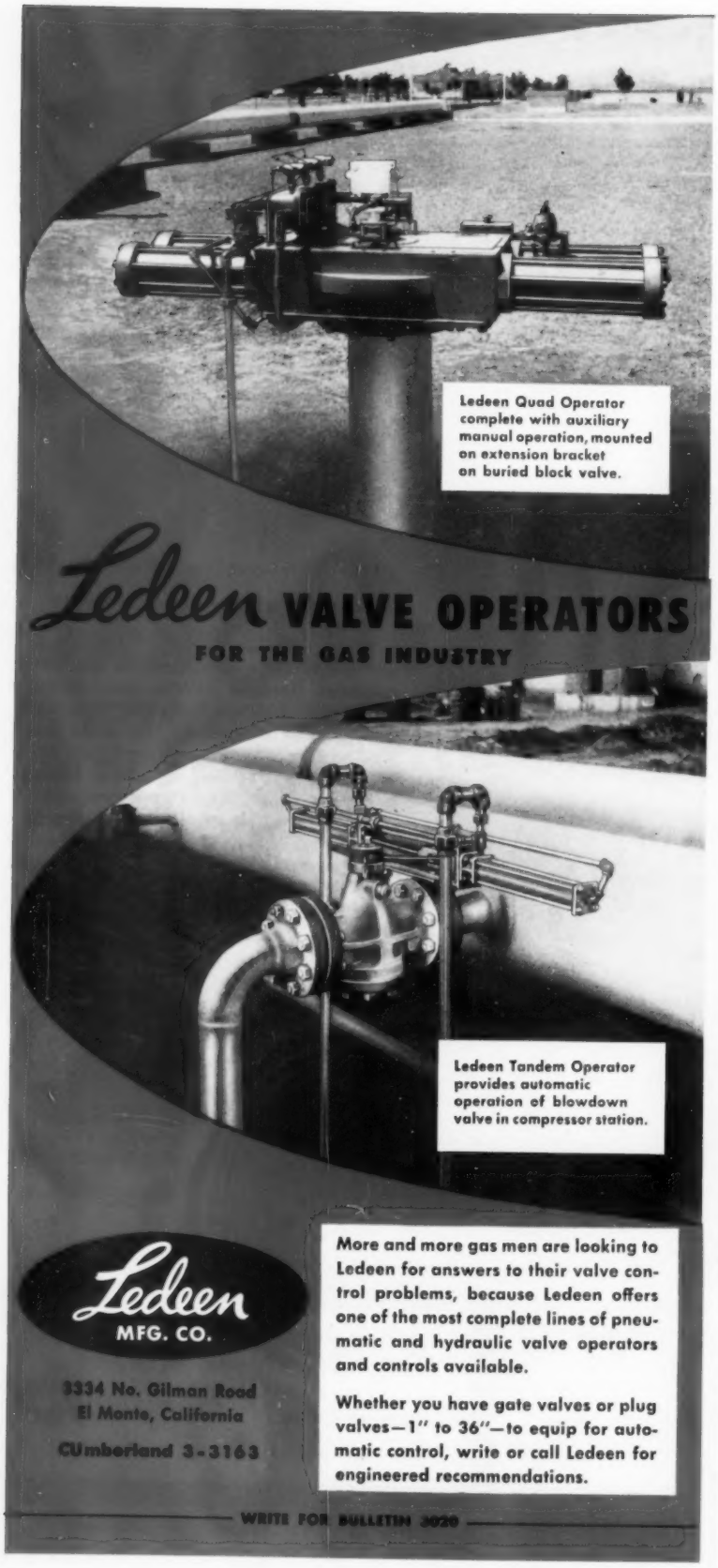
F. H. MALONEY Company

Houston, Texas

2301 TEXAS AVE. • FA 3-3161 • HOUSTON

LOS ANGELES • TULSA • OLEAN, N. Y.

SINCE 1932 — PRECISION IN RUBBER — METAL — PLASTICS


Ledeen Quad Operator complete with auxiliary manual operation, mounted on extension bracket on buried block valve.
Ledeen VALVE OPERATORS
FOR THE GAS INDUSTRY
Ledeen Tandem Operator provides automatic operation of blowdown valve in compressor station.
Ledeen MFG. CO.
3334 No. Gilman Road
El Monte, California
CUmberland 3-3163
More and more gas men are looking to Ledeen for answers to their valve control problems, because Ledeen offers one of the most complete lines of pneumatic and hydraulic valve operators and controls available.
Whether you have gate valves or plug valves—1" to 36"—to equip for automatic control, write or call Ledeen for engineered recommendations.
WRITE FOR BULLETIN 3020

in the public interest by privately owned facilities or by communications common carriers?"

Mr. Keller outlined the work that has been carried on by the gas and oil industries in "collecting, coordinating and organizing the data which they desired to present to the commission in order to set forth the case for the privately owned microwave systems in these vital industries."

The results of this work, he pointed out, present "a precise and realistic position on the present and future requirements of the petroleum and natural gas industries in the use of microwave." The position was embodied in the "Statement of Proposed Evidence" which was filed on behalf of the Central Committee on Radio Facilities of the API on March 29.

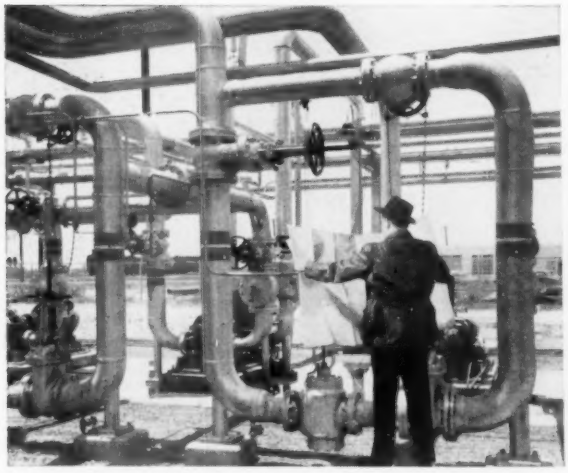
In outlining the testimony which the petroleum and natural gas industries presented in this statement, Mr. Keller pointed out that the Central Committee has selected three groups of witnesses to testify in the forthcoming oral hearing which should commence this spring. These include the management group, represented by top executives from petroleum refining and petroleum and natural gas companies, a group representing the major associations of these industries such as the Central Committee, the AGA, the National Petroleum Radio Frequency Coordinating Association and the PIEA. Included are a number of representatives from oil and gas companies who will testify regarding their companies' particular communication needs for microwave and the past, present and anticipated use of this communication vehicle.

In referring to the crowded radio spectrum in the southern and southwestern states, Mr. Keller pointed out that on March 18 the "Central Committee on Radio Facilities of the American Petroleum Institute and the National Petroleum Radio Frequency Coordinating Association filed a joint petition for rule making with the commission requesting that it amend its rules and regulations so as to allow Petroleum Radio users in the States of Texas, Oklahoma, Arkansas,

Speed up the job with

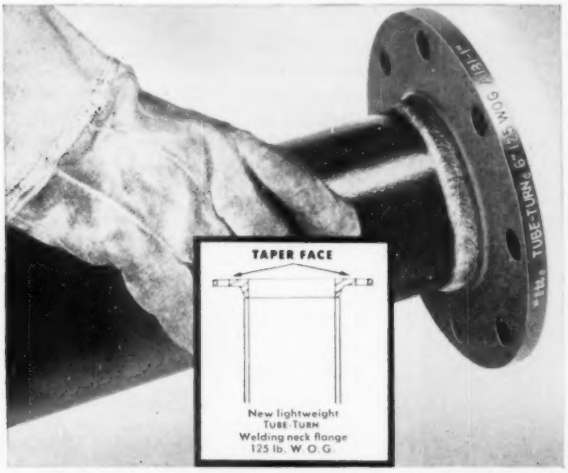
TUBE-TURN*

welding fittings and flanges



COMPLETE-LINE SERVICE. More than 12,000 standard items in the line of "TUBE-TURN" products . . . all types and sizes of welding fittings and flanges . . . schedules and materials to match *your* job. Available from your nearby Tube Turns' Distributor.

PIPELINE SPECIALS. There's a wide range of special TUBE-TURN fittings to simplify pipeline construction . . . new welding neck anchor forgings such as shown . . manifold fittings, full-encirclement saddles, venturi reducers, large diameter odd-angle elbows.



ADVANCED PRODUCT DESIGNS . . . such as the new TUBE-TURN Taper Face Welding Neck Flange. This lightweight flange for 125-lb. W.O.G. service cuts cost of low pressure distribution lines, affords effective seal, protects low pressure valve flanges from cracking.

PROMPT SERVICE! Your nearby Tube Turns' Distributor can supply you promptly. One order takes care of all your needs . . . no shopping around . . . less red tape. He makes available Tube Turns' engineering service on piping problems.

*"TUBE-TURN" and "tt" Reg. U. S. Pat. Off.

TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Detroit • Atlanta • New Orleans • Houston • Midland Dallas • Tulsa • Kansas City • Denver • Los Angeles • San Francisco • Seattle

In Canada: Tube Turns of Canada, Ltd., Ridgetown, Ontario • Toronto, Ontario • Edmonton, Alberta

tt TUBE-TURN

Louisiana, Mississippi, and New Mexico, whose operations require the use of frequencies in the 25-50-Mc band, to share, on a selective geographic basis, the use of 27 of the 100-odd frequencies located in the frequency spectrum between 30.86 Mc and 47.38 Mc, which frequencies are not presently allocated to the Petroleum Radio Service."

Mr. Keller pointed out that it was felt some form of immediate relief was necessary in these crowded areas, and that geographic sharing would afford the most feasible and quickest relief available. He said that there are a number of frequencies in the spectrum between 30-86 Mc. and 47.38 Mc. which could be shared with the petroleum radio users in the southern and southwestern states without any great degree of interference.

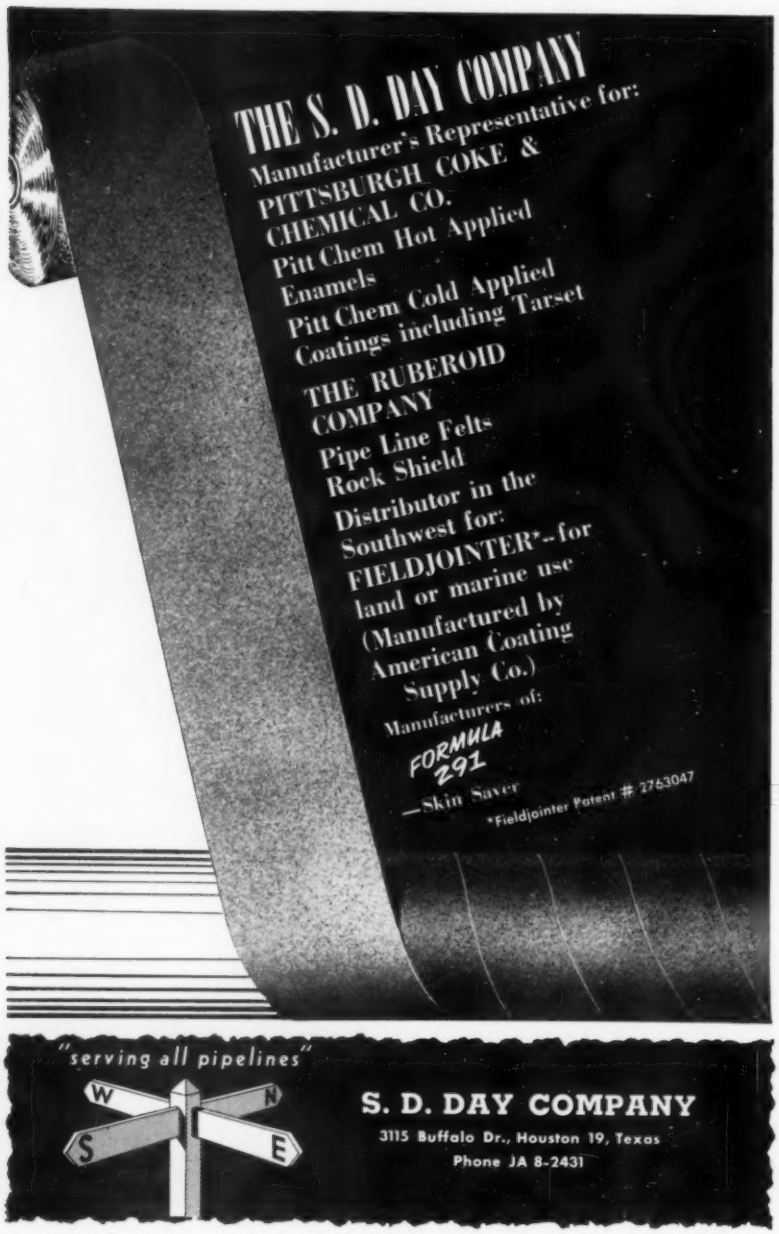
In continuing his report Mr. Keller discussed the tariff filings of the communications common carriers to cover their lease and maintenance of private mobile radio equipment. The PIEA, he said, participated in the investigation and hearing regarding the tariff filing of the Pacific Telephone & Telegraph Co. before the California Public Utilities commission.

"In the California case," he pointed out, "the position of the association was that the commission did not have jurisdiction to accept the tariff filing for this so-called 'service' because it did not represent a true public utility function of the telephone company, and that the commission's authority to accept the tariff was limited to those cases where the subject matter of the tariff was a true public utility function. Also, the association raised the issue as to the jurisdiction of the California commission to accept a tariff filing for activities which vitally affect interstate communications."

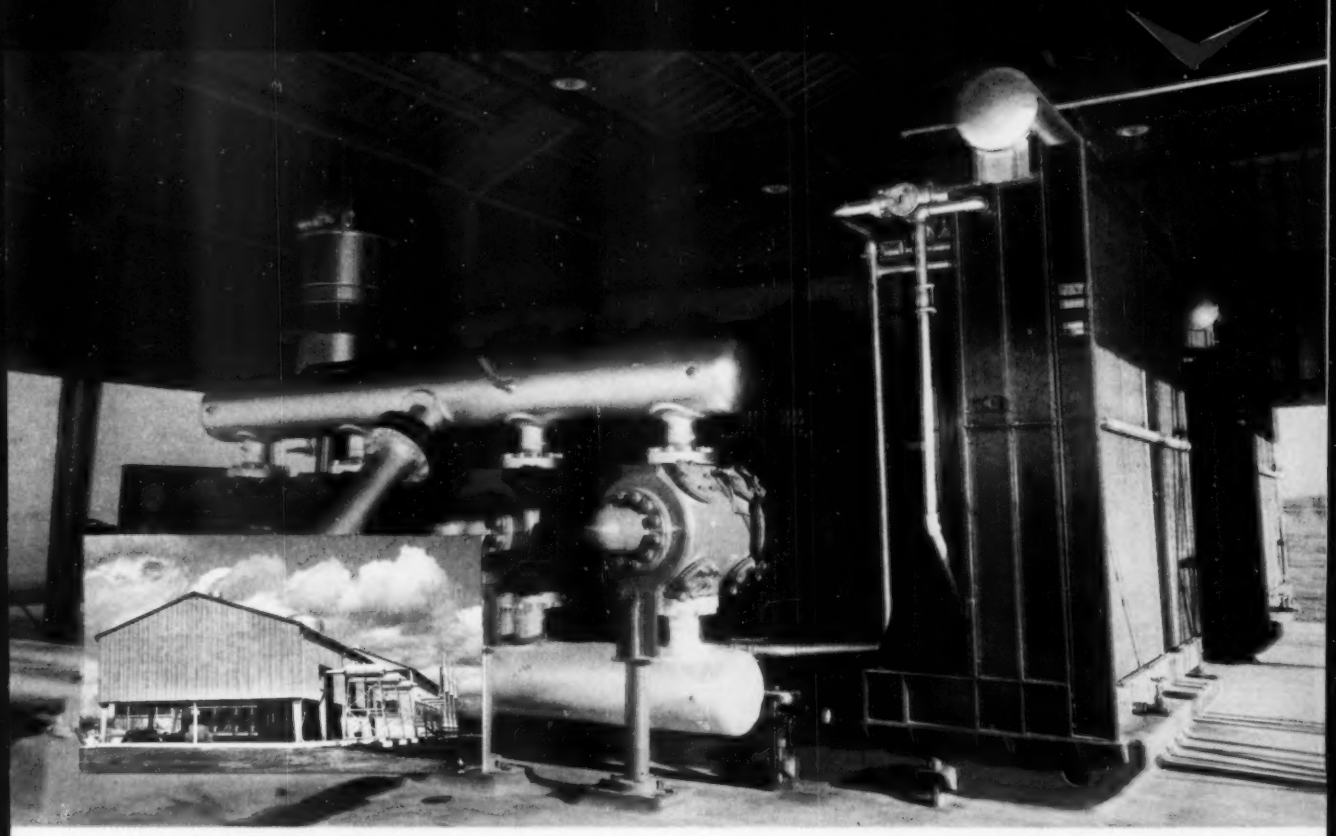
The Public Utilities Commission of California, he continued, "accepted the tariff and this acceptance was again questioned by the association in a petition for reconsideration, which was denied. Other parties, which were in agreement with the position of the association, were the City of Los Angeles and a number of communications service equipment companies operating in California. These other parties to the proceeding before the California commission have all petitioned the supreme court of California for a writ of review. When, and if, this writ is granted the Petroleum Industry Electrical Association should follow through in this matter and file an *amicus curiae* brief in support of the position of the opponents of the telephone company.

"As the events in the California case were coming to issue the American Telephone & Telegraph Co. filed a tariff before the Federal Communications Commission to cover their lease-maintenance activities. The petroleum industry made an immediate and effective response to this action of the telephone company by filing protests and requests for suspension of the tariff. The Petroleum Industry Electrical Association's protest outlined the real issues in this matter in a clear and concise manner.

"It is felt that the principal issue



BEAIRD-INGERSOLL-RAND Packaged Compressor Plant



SOUTHERN NATURAL GAS COMPANY's White Castle Supply Line Station, equipped with two Beaird-Ingersoll-Rand 10-SVG, 550 h.p. packaged compressors. Shown in inset is the Toca station where three 12SVG, 660 h.p. Beaird packaged compressors have been installed to supplement three large stationary units. Other sizes available from 120 to 660 h.p.

Economical Expansion —

PACKAGED UNITS ADDED TO STATIONARY COMPRESSOR INSTALLATION

SOUTHERN NATURAL GAS COMPANY's growing supply line systems are reaching toward the Gulf on both east and west sides of New Orleans. Pacing this expansion are two new packaged compressor installations boosting the increased gas volume to the main supply line station at Gwinville, Mississippi. The east side line is handled by the enlarged compressor station at Toca, Louisiana. Formerly equipped with three large stationary compressors, this plant has been expanded by adding three 12SVG 660 h.p. Beaird-Ingersoll-Rand packaged units. On the west line a new station at White Castle equipped with two 10SVG 550 h.p. units is offsetting the increased line pressure from Toca station and handling added gas volume.

Southern Natural selected packaged compressors for their expansion program as a result of their field experience. Package units have proved more flexible in service, were more economical to install, required less foundation work and when no longer needed can be almost wholly salvaged. Packaged compressor equipped stations have also been found to be easier and more economical to design for future horsepower additions.

Let us show you how economically Beaird-Ingersoll-Rand packaged compressor plants can be added to your compressor station.

BEAIRD
another AMF product
PACKAGED COMPRESSOR PLANTS

LOWEST COST PER HORSEPOWER INSTALLED

THE J. B. BEAIRD COMPANY, INC.
Shreveport, Louisiana
A subsidiary of American Machine & Foundry Company

SHREVEPORT, LOUISIANA • *Sales Offices: Dallas, Houston, Corpus Christi and Midland, Texas • New Orleans, Louisiana • Tulsa, Oklahoma • Denver, Colorado Los Angeles, California • Caracas, Venezuela, and Cie. Ingersoll-Rand, Paris, France.*

involved is whether or not the lease-maintenance activities of a telephone company are a proper subject for rate regulation by the commission. Title II of the Communications Act of 1934 evidences a Congressional intent to limit the regulatory power of the commission to those activities which are proper common carrier activities. Thus, unless the offerings made in these lease-maintenance contracts can be characterized as the offerings of a proper common carrier service, the commission has no power to accept the tariff. In sum, the question is really reduced to whether this renting of equipment by the telephone company in such a common carrier communication service is to be subject to the rate regulation of the commission. It is our position that this renting of equipment to private radio users to be used on their own frequencies is not a common carrier service as to come under the rate regulation of the commission. Furthermore, the mere fact that radio equipment is furnished by the telephone company, which also performs common carrier activities, does not mean the leasing of such equipment is part of its common carrier's 'public' business and therefore subject to their rate regulation of the commission. The renting of radio equipment is not different from the renting of automobiles or telephone equipment for private use. It is suggested that the leasing and maintaining of radio equipment by the American Telephone & Telegraph Co. is no different than the leasing and maintaining of radio equipment by any of the major equipment manufacturers or communication service companies. It would be absurd to call the lease-maintenance activities of an equipment manufacturer a 'common carrier service' and therefore call the equipment manufacturer a common carrier and, subject the rates in his lease-maintenance contract to commission regulation. Therefore, it is equally absurd to say that this private business undertaking of the telephone company is a common carrier service just because it is performed by a communications common carrier.

"Furthermore, it is felt that the acceptance of this tariff would contravene the rules of the commission in that, if the tariff were accepted it would presumably result in the telephone company's leasing equipment for use in the private radio services; namely, the Industrial Radio Service. However, Section 11.2 of the commission's rules states:

" 'Section 11.2—*General Limitations on Use.* The radio facilities authorized under this part shall not be used to render a communications common carrier service . . .'

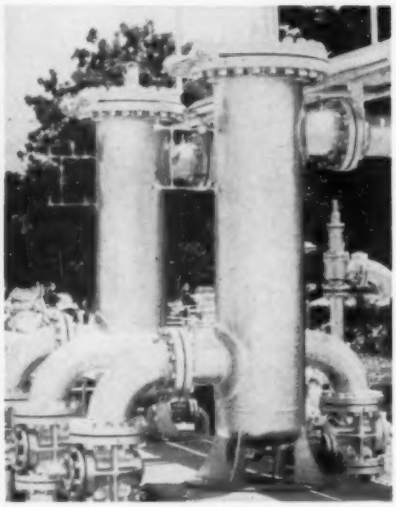
"Therefore, if the telephone company were permitted to lease and maintain equipment for use on private frequencies allocated to the Industrial Service under the subterfuge that such activity was the rendering of a communications common carrier service, this would be permitting a use of the Industrial Service by the communications common carriers to render a communications common carrier service. Thus, we see a dilemma is posed in that, if the lease-maintenance ac-

MOORLANE

GAS SCRUBBERS

AN ESSENTIAL ACCESSORY

FOR ALL GAS PIPE LINE SYSTEMS



Sizes available are 4-inch through 18-inch diameter vessels for any working pressure.

•

Capacity — up to 34,000,000 standard cubic feet per day.

•

Scrubber is dry type. No oil carry-over to worry about.

•

Filter medium is wool felt.

•

Removes all particles 5 microns (.0002") in size, and larger.

Efficiency remains constant from very low flows to extremely high volumes.

•

Low initial cost.

•

Inexpensive to operate and maintain.

WRITE FOR YOUR COPY OF BULLETIN MF-457 FOR DESCRIPTION AND PRICES

MOORLANE COMPANY

409 EAST ARCHER

TULSA 1, OKLAHOMA

USER BENEFIT No. 4

EASY FIELD MAINTENANCE

got GARRETT RELIEF VALVES

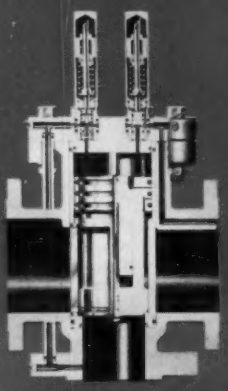
As usually interpreted, "maintenance" is a minor detail, simply because Garrett Relief Valves are designed and constructed to give long, trouble-free service under severe conditions. Working parts are subject to little or no wear, and when soft seats are used, even this usually vulnerable point becomes a matter of small concern.

However, to simplify field inspection and the infrequent replacement of parts, Garrett Valves are designed so that all parts are accessible and removable from the top. It is never necessary to break the line connection, and only common hand tools are required to service the valve completely.

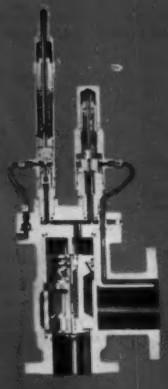
Field testing is accomplished very easily with the manual blowdown control, which permits a valve to be opened as often as desired simply by opening a small control valve.

In addition, a simple test fixture permits the set pressure and blowdown pressure to be checked or changed in the field, without removing the valve from the line.

Ask your Garrett representative for further information about "easy field maintenance" and other important features of Garrett Relief Valves, or write for literature.



Garrett Type "D" Relief Valve. Sizes, 1" through 8", single or dual outlets, for working pressures from 150 to 5000 psi. Supplied with soft or hard seats, screwed or flanged connections.



Garrett Type "E" Relief Valve. Sizes, 1" through 8", for working pressures from 25 to 200 psi. Soft or hard seats, screwed or flanged connections.

Garrett Oil Tools, Inc.
P. O. BOX 2427 • LONGVIEW, TEXAS

DIVISION OF [illegible] INDUSTRIES, INC

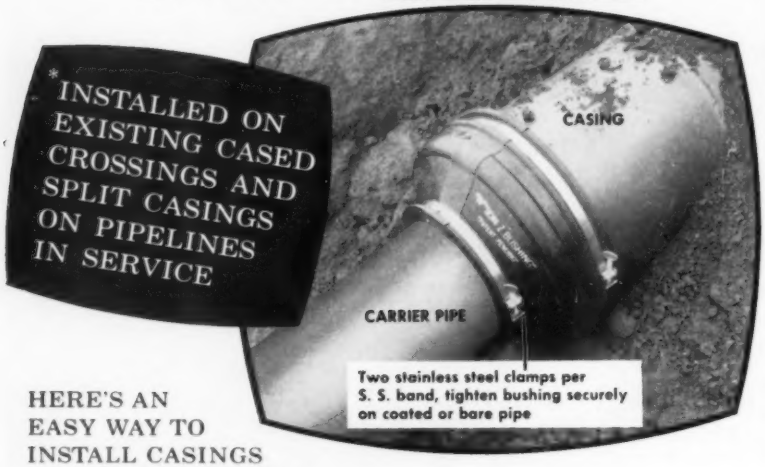
tivities are not a communications common carrier service, then the commission has no power to regulate these activities by accepting the tariff. However, if these activities are held to be a proper communications common carrier service, then the tariff must still be rejected since it proposes the rendering of a service in contravention to the commission's own rules."

A hearing in this case, which has been designated Docket 11972, commenced on May 1, 1957. The association planned to present witnesses to give factual evidence supporting the contentions in the association's petition. ■

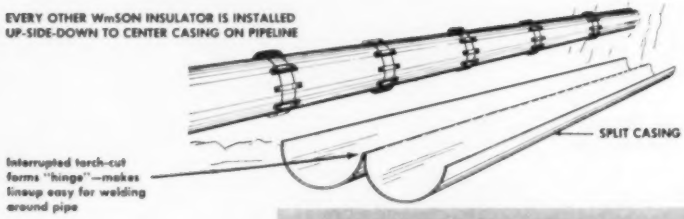
For more on the communications situation, turn to page 122 for a story from Neil Regeimbal, entitled "Gas industry confident in microwave battle."

They Go Together...

WmSEAL SPLICED "Z" BUSHINGS* for PIPELINES IN OPERATION


* INSTALLED ON EXISTING CASED CROSSINGS AND SPLIT CASINGS ON PIPELINES IN SERVICE
CASING
CARRIER PIPE
Two stainless steel clamps per S. S. band, tighten bushing securely on coated or bare pipe

HERE'S AN EASY WAY TO INSTALL CASINGS ON LINES IN SERVICE


EVERY OTHER WmSON INSULATOR IS INSTALLED UP-SIDE-DOWN TO CENTER CASING ON PIPELINE
SPLIT CASING
Interrupted torch-cut forms "hinge"—makes lineup easy for welding around pipe

Write for bulletin

Improved spliced "Z" Bushings are complete with easy to apply cold patch kit.

T.D. Williamson, Inc.

P. O. BOX 4038 TULSA 9, OKLAHOMA

REPRESENTATIVES: HOUSTON · AMARILLO · PITTSBURGH · PLAINFIELD, N. J. · JOLIET, ILL. · JACKSON, MICH. · LOS ANGELES · SAN FRANCISCO BARTLESVILLE, OKLA. · SEATTLE · EDMONTON · TORONTO · CALGARY VANCOUVER · BUENOS AIRES · CABIMAS, ZULIA, VENEZUELA DURBAN, NATAL, SOUTH AFRICA · PARIS, FRANCE · SIDNEY, AUSTRALIA

people • *Continued*

from page 136

James A. Laing
NGPL

George Garver
NGPL

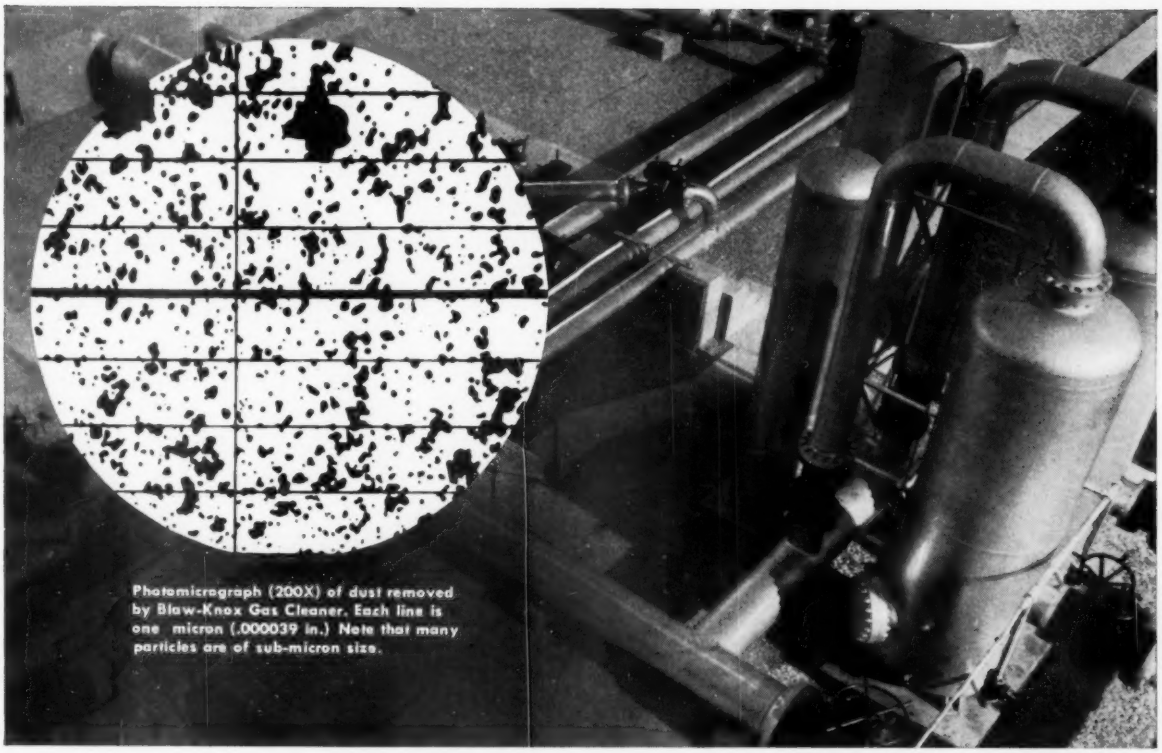
from assistant vice president to vice president of operations, succeeding Mr. Burlingame; FREDERICK K. MACDONALD from assistant treasurer and assistant secretary to treasurer and assistant secretary; GEORGE BEM from superintendent of the treasury division to assistant treasurer; JAMES A. LAING from assistant secretary to secretary; CHARLES G. FREUND from administrative assistant to Mr. Garver to the position of assistant secretary; and WAYNE SIMPSON from general superintendent of accounting to comptroller.

W. K. SANDERS has been elected president of Trunkline Gas Co., Houston. Mr. Sanders, who has been vice president of Trunkline since its construction in 1950, succeeds W. G. MAGUIRE to the presidency of the Panhandle Eastern Pipe Line Co. subsidiary. Mr. Maguire is chairman of both Panhandle and Trunkline.

F. T. DALY is now East Coast and Southeast sales representative for RCA microwave equipment and systems. He succeeds L. R. VINCENT, who was recently appointed to a sales post with RCA's West Coast electronic products department in Los Angeles. F. H. LONG will succeed Mr. Daly as microwave marketing and sales analyst.

F. K. Macdonald
NGPL

Dwight Sprow
NGPL



Photomicrograph (200X) of dust removed by Blaw-Knox Gas Cleaner. Each line is one micron (.000039 in.) Note that many particles are of sub-micron size.

dust particles 20 microns and below travel easiest, farthest — do the most damage

Field tests prove Blaw-Knox Gas Cleaners remove even the smallest dust particles

The test of any gas cleaner's efficiency should be measured *not* in terms of the amount of dust collected, but in terms of the quantities entrained in the "clean" gas. The removal of a high percentage of large dust particles is a relatively easy task. However, it is the particle sizes of 20 microns and below that travel easiest, farthest and cause the most damage. Blaw-Knox Gas Cleaners remove even the smallest particles of these dusts.

A large number of field performance tests have been run to determine the dust removal capacity of Blaw-Knox Gas Cleaners. Inlet dust loadings ranged up to 547 pounds per million cubic feet of gas. Tests on the cleaner outlet showed absolutely no dust getting past.

The ability of Blaw-Knox Gas Cleaners to maintain such performance is due to an exclusive operating principle through which each tiny particle of dust is placed immediately in violent, intimate contact with oil. In the expansion separation stages, a major portion of dust-laden oil drops out of the gas stream. An oil-wet, multiple baffle, primary separator catches and agglomerates the remaining tiny wet particles. Finally the gas is scrubbed by an efficient, multiple vane mist extractor.

When you buy, be sure to specify Blaw-Knox, for when you place a Blaw-Knox Gas Cleaner on stream, you're sure to remove even the smallest particles of dust.

YOUR GAS CLEANER SHOULD:

remove *all* pipeline dust

have no moving parts to wear

have no filtering section to be plugged by incoming dust

require no external source of power

operate with *low* oil loss

have adequate dust storage capacity

require minimum maintenance

Blaw-Knox Gas Cleaners meet *all* these requirements, give you proven protection

BLAW-KNOX

BLAW-KNOX COMPANY

Buflovak Equipment Division
1543 Fillmore Avenue
Buffalo 11, New York

Troy R. Stilley
Good-All

W. M. Elmer
Texas Gas

J. M. Barton
Northern Natural

James E. Poole
Poole Specialties

Robert Gaynor
Darling Valve

Foster Backus
Darling Valve

Darling Valve & Manufacturing Co., Williamsport, Pa., has appointed FOSTER E. BACKUS to the post of Midwest regional sales manager. He will headquarter in Toledo, Ohio. The company has also named ROBERT C. GAYNOR as a new sales engineer working out of the Toledo office. He will concentrate his efforts in Michigan and adjacent parts of Indiana and Ohio. The Midwest region is composed of 13 states from western Pennsylvania to the Dakotas and south to Kentucky.

J. M. BARTON is now vice president of Northern Natural Gas Producing Co., a subsidiary of Northern Natural Gas Co., Omaha. In his new capacity, Mr. Barton, formerly exploration manager, will continue to report directly to John M. Hanley, vice president of Northern Natural and the production subsidiary.

TROY R. STILLEY has been named general manager of the electrical-mechanical division of Good-All Electric Manufacturing Co., Ogallala, Neb. Mr. Stilley joined Good-All Electric in 1956 and has served as field service manager, production manager, and assistant general manager.

W. M. ELMER has been elected executive vice president of Texas Gas Transmission Corp., Owensboro, Ky. Mr. Elmer, former senior vice president of the company, will continue to serve as president of Texas Gas Exploration Corp. and as a director of both organizations.

JAMES E. POOLE, formerly general sales manager of Keystone Asphalt Products division of American-Marietta Co., has formed his own business as a manufacturers representative. Sales office of the company, Jim Poole Construction Specialties, is in Arlington Heights, Ill.

D. G. SISTERSON, partner in the firm of D. G. Sisterson & Co., has been elected a director of Texas Gas Transmission Corp.

Experience

There is no Substitute for Proven Experience

Houston
CONTRACTING COMPANY
GENERAL CONTRACTORS
Laurence H. Favrot • R. P. Gregory • Geo. A. Peterkin

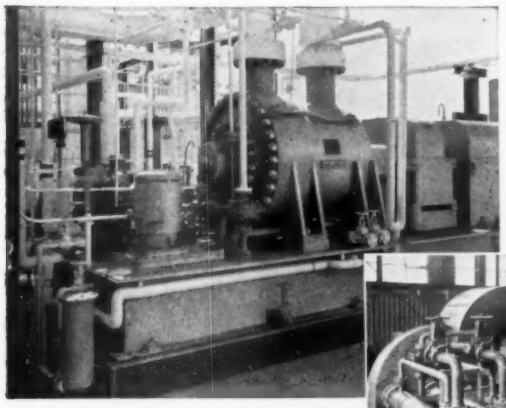
OIL • GAS
GASOLINE
WATER PIPE LINES

2707 FERNDALE
HOUSTON 6, TEXAS

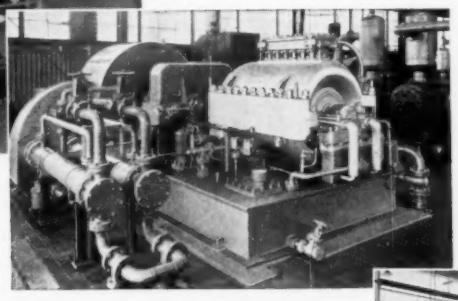
HOW 3 BASIC TYPES OF I-R

CENTRIFUGAL COMPRESSORS

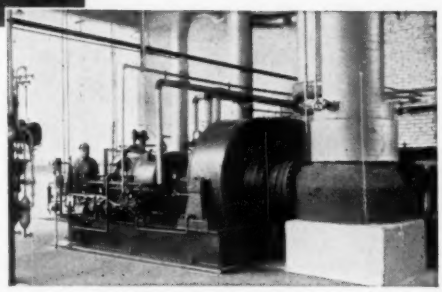
cover practically all of your process requirements



1. MULTI-STAGE VERTICALLY-SPLIT
Capacities to 9,000 cfm
Pressures to 2,200 psi



2. MULTI-STAGE HORIZONTALLY-SPLIT
Capacities to 165,000 cfm
Pressures to 625 psi

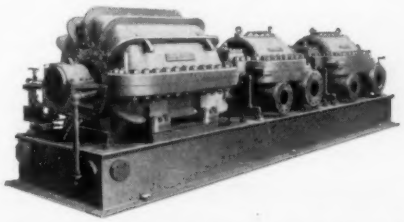


3. SINGLE-STAGE
Capacities to 255,000 cfm
Pressures to 1,000 psi

Here are the three basic types of Ingersoll-Rand centrifugal air and gas compressors. The complete range of sizes available in each type provides extremely wide latitude to meet process conditions. By combining two or more individual units of the same or different types in tandem or in series, a great range of capacities and pressures are obtainable (units up to 2,000 psi have been furnished).

Any type of drive can be used and combination units can be individually powered or driven from a single source — electric motor, steam turbine or gas turbine. This flexibility of application is one reason why more and more I-R centrifugals are being installed in all types of process service.

Ingersoll-Rand has supplied more horsepower of industrial centrifugal compressors and Turbo-Blowers than any other manufacturer. This long experience means greater dependability, higher sustained efficiency and less maintenance expense. If you have a process compression problem, call in your I-R engineer. His experience in this specialized field can save you time, effort and expense from initial planning to on-stream operation.



Typical series combination of three multi-stage horizontally split centrifugal compressors mounted on a single base and arranged for a common drive.

12-404

Ingersoll-Rand

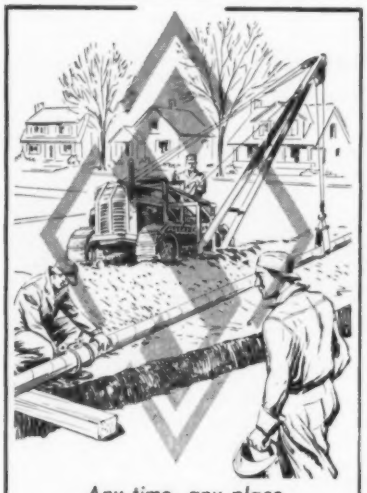
11 Broadway, New York 4, N. Y.

COMPRESSORS • GAS AND DIESEL ENGINES • ROCK DRILLS • PUMPS • TURBO-BLOWERS • AIR AND ELECTRIC TOOLS

MILLARD K. NEPTUNE, formerly general manager of Sahara Petroleum Co., Alexandria, Egypt, heads up Texas Eastern Transmission Corp.'s expanding products pipeline division. Mr. Neptune, who will headquarter in Shreveport, fills the newly created post of executive vice president, products division, and will be in charge of all products pipeline operations.

TOM H. WHEAT, corporate secretary of Transcontinental Gas Pipe Line Corp., Houston, has been elected president of the Houston regional group of the American Society of Corporate Secretaries Inc.

BILLY D. CASS and JAMES G. HUDNALL have been appointed sales engineer and service engineer respectively by the J. B. Beaird Co., Inc., Shreveport. Mr. Cass will cover the territory from Tulsa to Denver. Mr. Hudnall will be based in Shreveport.



Any time, any place

SOMERVILLE

is ready to complete your next job with speed and efficiency.

SOMERVILLE CONSTRUCTION CO.
Ada, Michigan

SIGN OF TRANSMISSION LINES — SATISFACTION DISTRIBUTION SYSTEMS

The R. W. STAFFORD CO.
GAS CONSULTANTS—ENGINEERS—CONSTRUCTORS

Natural Gas Conversions
Plant Management and Operation
Peak Shaving and Standby Plants
Accident and Insurance Investigations

EVANSTON, ILLINOIS
2944 Grant St. — Phone UNiversity 4-6190

GAS progress reports

NEW CONSTRUCTION PLANNED

NATURAL GAS PIPELINE CO. OF AMERICA. Chicago. To install 337 miles of 30-in. loop between Fritch, Texas and Beatrice, Neb., and 59 miles of 36-in. between Beatrice and Joliet, Ill. Also 29,750 hp in compression at stations from Texas to Illinois. Will add 185 MMcf/day to capacity.

CURRENT CONSTRUCTION

ALBERTA GAS TRUNK LINE CO. LTD., to build 550-mile gathering line in Alberta. 1956 construction consisted of Red Deer river crossing near Bindloss.

EL PASO (TEXAS) NATURAL GAS CO. Docket G-10481 to install 28.1 miles of 10¾-in. line in Nolan and Coke Counties, Texas; install new 1320-hp compressor station at Jameson. Line completed. Work underway on compressor.

KANSAS-NEBRASKA NATURAL GAS CO., Hastings, Neb. Docket G-10014. The 2700-hp additions at five compressor stations have been completed. 32.7 miles of line to get under way by Brodie Construction Co. Work calls for 11.5 miles of 12-in., 10 miles of 10-in., 10 miles of 8-in., with 1.2 miles of 6-in. already completed.

MICHIGAN WISCONSIN PIPE LINE CO., Detroit. Docket G-2327 15.5 miles of 4- and 6-in. line to Three Rivers, Mich. under construction; 25 miles of 24-in. in Wisconsin and 18.5 miles of 4-in. in Iowa, Illinois, Wisconsin and Michigan authorized and scheduled for completion this year. All other construction under this docket has been completed and is in operation.

MONTANA-DAKOTA UTILITIES CO., Minneapolis. Docket G-10521. Remaining compressors (two 540-hp at Baker, Mont.) scheduled for installation next summer.

MOUNTAIN FUEL SUPPLY CO., Salt Lake City. Dockets G-10426 and 10446. To build 38 miles of 20-in line and compressors to transport from Sweetwater county in southern Wyoming 60 MMcf/day purchased from Pacific Northwest Pipeline Corp. Also 2640 hp addition at existing compressor station. 5 miles line and compressors completed. Balance pending.

NORTHERN NATURAL GAS CO., Omaha. Dockets G-2399, et al, for 654 miles of line and an additional 12,640 hp in compressor capacity. Also 15-mile 24-in. line from Ogden, Iowa to underground storage near Redfield; 168-mile 20-in. from Twin City area to Duluth and Superior; 92-mile 12-in. and 71-mile 10-in. line in South Dakota and 307 mile of branch lines. Compressor additions and 15-mile line to test Redfield storage project approved. Contracts for compressors and line let to H. B. Zachary, Dresser Engineering Co., Foor Engineering Co., R. H. Fulton & Co., and Pentzien Inc. Newly approved portion includes a total of 354 miles of line and 18,640 hp in compressor capacity broken down as follows: 163-miles extension from Sioux Falls, S. D. area to Aberdeen, S. D. plus 160 miles of branch lines in South Dakota. Not approved is the Duluth-Superior extension.

PACIFIC GAS & ELECTRIC CO., San Francisco. For 83-mile 20-, 18-, and 16-in. line from Beehive Bend field near Willows, Calif., to a point near Davis and then east into Sacramento. About 53 per cent complete.

PERMIAN BASIN PIPELINE Co., Omaha. Dockets G-9688 and 9724. For 19-mile, 16-in. line and 6750-hp compressor station in Andrews county, Texas, to take gas from Phillips gasoline plant. Gasoline Plant Construction Corp. Houston building compressor station; R. H. Fulton the line.

SOUTHERN CALIFORNIA and SOUTHERN COUNTIES GAS CO., Los Angeles. A 241-mile 30-in. line from Newhall, Calif. to Colorado river near Needles to meet El Paso Natural line from San Juan and Permian basins. R. H. Fulton & Co., Lubbock, Texas, started construction in January. Completion scheduled for June 1957. Four 2000-hp compressors will be installed at new station near Needles. Schedule to begin operation in November.

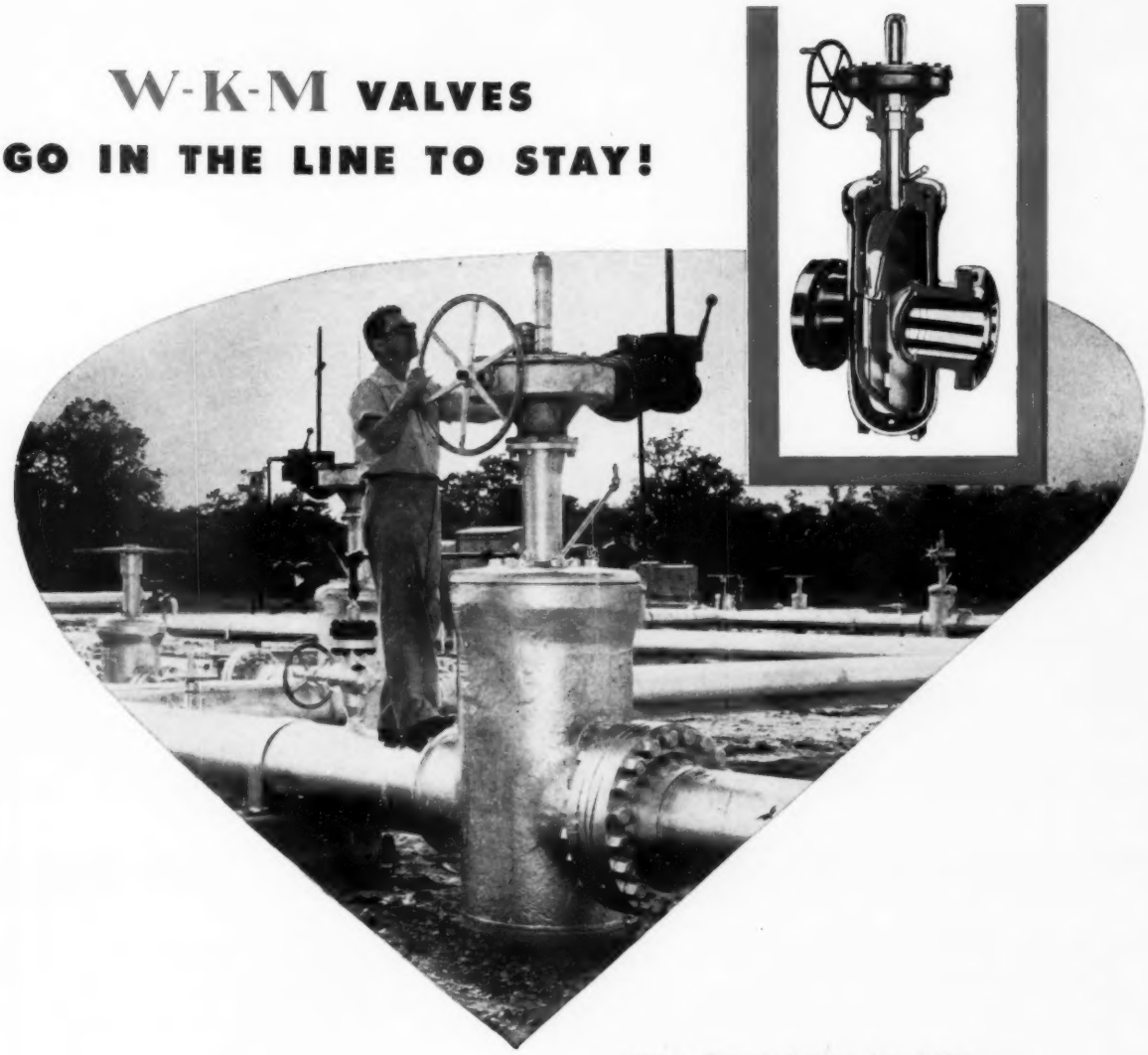
TEXAS EASTERN TRANSMISSION CORP., Shreveport. Dockets G-2503, 9784-87. 422 miles of 30-in. line near Mexican border to transport gas to Texas Eastern's Vidor, Texas station; approximately 45 miles of 24-in. pipe connecting TET's existing line near Provident City, Texas, to the new line; pipeline loops totaling about 77 miles at various locations along existing 30-in. system; approximately 147 miles of supply and sales laterals; new and additional compression facilities totaling 32,250 hp; and approximately 20 sales measuring and regulating stations.

TRANS-CANADA PIPE LINES LTD., for 2287-mile gas line taking Alberta gas from Alberta - Saskatchewan border to Toronto and Montreal, with lateral from Winnipeg to Emerson, Man., 34-in. line from Alberta border to Winnipeg under construction. 30-in. from Winnipeg to Toronto; 24- and 20-in. from Toronto to Montreal; 24-in. from Winnipeg to Emerson; 10 compressor stations totaling 105,000 hp. First four sections of line under contract to Majestic Contractors Ltd., Mannix Ltd., Canadian Bechtel Ltd., and Dutton-Williams Brothers. By November, 230 miles of 34-in. had been ditched.

WASHINGTON (D.C.) GAS LIGHT CO. Docket G-10090 for 26.1-mile, 24-in. line from Dranesville, Va. to a point near Washington. Work nearly completed.

WESTCOAST TRANSMISSION CO. LTD., Calgary. To build 650-mile, 30-in. line from Peace river area to near Vancouver, B. C., to connect with line of Pacific Northwest Pipeline Corp., to transport 400 MMcf daily, of which 300 MMcf is to be delivered to PNW. 400 miles of line installed and ready for testing. Scheduled for completion in fall of 1957.

W-K-M VALVES
GO IN THE LINE TO STAY!



W-K-M
DIVISION OF ACF INDUSTRIES INCORPORATED
PLANT: MISSOURI CITY, TEXAS
MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

5702

Bring your valve reference library up-to-date by writing Dept. K-6 for new W-K-M ASA Through-Conduit Gate Valve Catalog 300.

W-K-M Through-Conduit Gate Valves stay "in the line" because their superior design provides free and easy operation, positive seal under any pressure, and freedom from turbulence and destructive erosive action.

They stay "in service" when and if repairs are necessary. Gate and segment, seats, stem, bonnet, seal ring, and clamp ring can be removed and replaced without removing the valve from the line.

For valves that stay in service and in the line year after year, specify **W-K-M** Through-Conduit Gate Valves.

W-K-M ASA Through-Conduit Valves are available in sizes 2″ through 30″—ASA 300 lbs. to ASA 900 lbs. Valves up to 12″ are available through Supply Stores.

MANUFACTURERS OF W-K-M GATE VALVES · ACF LUBRICATED PLUG VALVES · KEY-KAST ALLOY STEEL PIPING FITTINGS · KEY RETURN BENDS AND FITTINGS

— INDEX TO ADVERTISERS —

Aerotec Corp. —
American Cast Iron Pipe Co. 40
American Liquid Gas Corp. —
American Meter Co. Front Cover, 26, 27, 79
American Recording Chart Co. 94
American Telephone & Telegraph Co. 104
Anchor Petroleum Co. 100
Anderson Co., V. D. —

Badger Machine Co. —
Barber-Greene Co. —
Barrett Div., Allied Chemical & Dye Corp. —
Barton Instrument Corp. —
Baso Inc. —
Beaird Co., Inc., J. B. 145
Black, Sivalls & Bryson Inc. Third Cover
Blaw-Knox Co. 149
Bonney Forge & Tool Works —
Bristol Co. 106
Brooklyn Borough Gas Co. —
Bucyrus-Erie Co. —
Burgess-Manning Co. —
Busada Manufacturing Co. —

Carbide & Carbon Chemicals Div., Union Carbide & Carbon Corp. 82
Case Co., J. I. 7
Cast Iron Pipe Research Assn. 28, 29
Chaplin-Fulton Mfg. Co. 21
Clark Bros. Co. —
Cleveland Trencher Co. 81
Connelly Inc. 98
Consolidated Electrodynamics Corp. 138
Cooper-Bessemer Corp. 135
Copon Associates 131
Crane Co. 79
Crose Mfg. Co., M. J. —
Crutcher-Rolfs-Cummings Inc. —
Cutler-Hammer Inc. 1

Darling Valve & Manufacturing Co. —
Day Co., S. D. 144
Dearborn Chemical Co. 117
Dollinger Corp. —
Dow Chemical Co. 39
Drake & Townsend Inc. —
Dresser Industries, Inc. —
Clark Bros. Co. —
Dresser Manufacturing Div. —
Roots-Connersville Blower Div. 77
Duriron Co. Inc. 74

Earth Equipment Corp. 103
Eastman Chemical Products —
Ebasco Services, Inc. 34
Edwards Inc., Allan —
E-I-M Co., Inc. —
Electro Rust-Proofing Corp. 80

Fish Engineering Corp. 123
Fisher Governor Co. 4, 5
Fisher Research Laboratories, Inc. 91
Foster Co., L. B. 24
Foxboro Co. 120

Garrett Oil Tools Inc. 147
GAS Subscription Order 101
General Controls 75
Goodrich Chemical Co., B. F. —
Grabler Manufacturing Co. 13
Grayson Controls Div., Robertshaw-Fulton Controls Co. 71
Greenlee Tool Co. 98
Griffiths Co., E. F. —
Grove Valve & Regulator Co. 97

Hallen Construction Co. Inc. —
Hardwick Stove Co. —
Hays Manufacturing Co. 93
Heath Survey Consultants Inc. —
Hill, Hubbell & Co. —
Homestead Valve & Manufacturing Co. 41
Houston Contracting Co. 150
Hydrauger Corp. 95

Ingersoll Rand Co. 151
International Business Machines 42

Jaeger Machine Co. —
Johns-Manville Corp. —
Jones & Laughlin Steel Corp. 137

Kaiser Steel Corp. 124
Ka-Mo Tools Inc. —
Koenig Iron Works Inc. —
Koppers Co. Inc.—Tar Products —

Lancaster Meter Parts Co. 101
Ledeen Manufacturing Co. 142
L.O.F. Glass Fibers Co. —
Lone Star Steel Co. 3

Mack Iron Works Co. 100
Maloney Co., F. H. 141
Maxitrol Co. 76
McDonald Mfg. Co., A. Y. —
Midwestern Pipe Line Products Co. —
Mine Safety Appliances Co. —
Minnesota Mining & Mfg. Co. 22
Moeller Mfg. Co. 78
Moorlane Co. 146
Motorola Communications & Electronics, Inc. —
Mueller Co. 17-20

National Tank Co. —
National Tube Div., U. S. Steel Corp. —
Natural Gas Odorizing Div., Cue Fastener Corp. —
Naugatuck Chemical Div. U. S. Rubber Co. 14
New England Forestry Service Inc. —
Nordberg Manufacturing Co. —
Nordstrom Valve Div., Rockwell Manufacturing Co. 32, 33
Norton-McMurray Manufacturing Co 92
Norwalk Valve Co. —

Ohio Injector Co. 129
Oliver-Tyrone Corp., Berry Div. —
Oronite Chemical Co. 9

Parsons Co. 99
Peerless Manufacturing Co. 35
Peerless Manufacturing Corp. —
Pennsylvania Salt Mfg. Co., Ind. Div. —
Perfex Plastics Inc. —
Perrault Equipment Co. —
Philco Corp. —
Pipe Line Development Co. —
Pittsburgh Coke & Chemical Co. 16
Pittsburgh Equitable Meter Div., Rockwell Manufacturing Co. 37, 38
Pittsburgher Hotel —
Polyken Products Div. Kendall Co. 72
Protecto-Wrap Co. —

Quick-Way Truck Shovel Co. —

Radiator Specialty Co. 102
Radio Corp of America 115
Reed Manufacturing Co. 102
Reliance Regulator Div., American Meter Co. Second Cover
Republic Steel Corp. —
Reynolds Gas Regulator Co. 91
Ridge Tool Co. —
River Construction Corp. —
Robertshaw-Fulton Controls Co., Grayson Controls Div. 71
Rockwell Manufacturing Co.
Instrument Div. 127
Nordstrom Valve Div. 32, 33
Pittsburgh Equitable Meter Div. 37, 38
Roots-Connersville Blower Div., Dresser Industries, Inc. 77

Safety Gas Main Stopper Co. 103
Schield Bantam Co. 140
Shafer Valve Co., Inc. —
Sheehan Pipeline Construction Co. —
Sinclair Oil & Gas Co. —
Skinner Co., M. B. 23
Smith Corp., A. O. —
Somerville Construction Co. 152
Southern Cross Foresters —
Sprague Meter Co. Fourth Cover
Stafford Co., R. W. 152
Standard Electric Time Co. —
Standard Magnesium Corp. 90
Standard Pipeprotection, Inc. —
Superior Meter Co. 31

Tapecoat Co. —
Taylor Forge & Pipe Works 132, 133
Telsco Fittings Div. 95
Tennessee Gas Transmission Co. —
Thermac Co. 83
Transcontinental Gas Pipe Line Corp. —
Tube Turns, Inc. 143
Tulsa Winch Div., Vickers Inc. —

Union Carbide & Carbon Corp., Carbide & Carbon Chemicals Div. 82
Union Malleable Mfg. Co. —
United Engineers & Constructors —
United Pipe Line Contractors Inc. 10
U. S. Pipe & Foundry Co. 36
U. S. Rubber Co. Naugatuck Chemical Div. 14
U. S. Steel Corp., National Tube Div. —
Universal Controls Corp. —

Vermeer Manufacturing Co. 100
Vulcan Rubber Products, Inc. 96

Wachs Co., E. H. —
Warren Petroleum Corp. 102
Webster Engineering Co. —
Williamson, Inc., T. D. 148
Willys Motors Inc. 30
W-K-M Mfg. Co., Inc. 153
Wood Co., John —
Wood Industries Inc., Gar —

Youngstown Sheet & Tube Co. 119

"Pace Setter" For The Oil Patch . . .

The BS&B Model GDH COLD-FRAC SYSTEM With Hydrate Inhibitor

BS&B "COLD-FRAC" Units with hydrate inhibitor (Model GDH) were especially developed for gas-condensate wells having an available pressure drop of 500 psi or greater, where gas dehydration and hydrocarbon dew point control present a problem.

The outstandingly successful performance of these Model GDH units in producing a maximum volume of condensate, and in dehydrating the processed gas to pipeline specifications, is due in part to the fact that each unit is specifically engineered to fit the conditions at the lease where it is to be operated.

If you are not now using a BS&B Model GDH "COLD-FRAC" Unit on your lease, why not talk it over with your BS&B Man? Or, send us the following information upon which to base our recommendation for a unit to efficiently handle your lease production:

1. Minimum inlet wellstream pressure and maximum inlet wellstream temperature.
2. Maximum wellstream flow rate.
3. A Podbielniak analysis of the wellstream (if available).
4. Liquid-Gas Ratio from welltest with test conditions.
5. Gas Transmission line pressure.
6. Desired Vapor pressure of stabilized condensate and storage pressure.
7. Presence of paraffin (cloud point of liquid from high pressure wellstream at wellhead flowing pressure and temperature).
8. Volume of salt water produced.

Basic Components of the Model GDH Unit to Separate End Products Include:

1. Inlet Liquid Knockout
2. Secondary Liquid Knockout
3. Cold Liquid-Gas Separator With Inlet Choke
4. Stabilizer

Auxiliary Components Include:

1. Wellstream Cooler
2. Product Cooler
3. Glycol Pump
4. Glycol Regenerator
5. Glycol-Oil Separator
6. Hydrate Catcher With Pressure Controller for Safety Shut-In

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY — ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.

Oilfield Equipment Division, Dept. 1-BQ6

P. O. Box 1714 Oklahoma City, Oklahoma

This trade mark, on all Sprague products and parts, is your assurance of outstanding quality. Proudly we stand back of every item we manufacture for the growing Gas Industry. Meters that retain their accuracy with a minimum of maintenance; accessories that simplify installations and aid in attaining trouble free service.

THE Sprague METER COMPANY
BRIDGEPORT 4, CONNECTICUT

WESTERN BRANCH FACTORY — LOS ANGELES 23, CALIF. REGIONAL OFFICES — DAVENPORT, IOWA HOUSTON 3, TEXAS SAN FRANCISCO 11, CALIF.

Gas Meters of Simplified Design and Sustained Accuracy